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THE UNSEEN UNIVERSE

OR

PHYSICAL SPECULATIONS

ON A

FUTURE STATE

[by B. Stewart and P.G. Tait]

— the things which are seen are temporal, but the things which are not seen are eternal.

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Joseph L. Richards
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. . . . μὴ σκοπούντων ἡμῶν τὰ βλεπόμενα, ἀλλὰ τὰ μὴ βλεπόμενα· τὰ γὰρ βλεπόμενα, πρόσκαιρα· τὰ δὲ μὴ βλεπόμενα, αἰώνια. Πρὸς Κορινθίους, Β'. δ'.

Animula! vagula, blandula,
Hospes comesque corporis,
Quae nunc abibis in loca,—
Pallidula, rigida, nudula . . . .
HADRIAN.

"God hath endowed us with different faculties, suitable and proportional to the different objects that engage them. We discover sensible things by our senses, rational things by our reason, things intellectual by understanding; but divine and celestial things he has reserved for the exercise of our faith, which is a kind of divine and superior sense in the soul. Our reason and understanding may at some times snatch a glimpse, but cannot take a steady and adequate prospect of things so far above their reach and sphere. Thus, by the help of natural reason, I may know there is a God, the first cause and original of all things; but his essence, attributes, and will, are hid within the vail of inaccessible light, and cannot be discerned by us but through faith in his divine revelation. He that walks without this light, walks in darkness, though he may strike out some faint and glimmering sparkles of his own. And he that, out of the gross and wooden dictates of his natural reason, carves out a religion to himself, is but a more refined idolater than those who worship stocks and stones, hammering an idol out of his fancy, and adoring the works of his own imagination. For this reason God is nowhere said to be jealous, but upon the account of his worship."—*Pilgrim's Progress*, Part III.

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PREFACE.

Forgetful of the splendid example shown by intellectual giants like Newton and Faraday, and aghast at the materialistic statements nowadays freely made (often professedly in the name of science), the orthodox in religion are in somewhat evil case.

As a natural consequence of their too hastily reached conclusion, that modern science is incompatible with Christian doctrine, not a few of them have raised an outcry against science itself. This result is doubly to be deplored; for there cannot be a doubt that it is calculated to do mischief, not merely to science but to religion.

Our object, in the present work, is to endeavour to show that the presumed incompatibility of Science and Religion does not exist. This, indeed, ought to be self-evident to all who believe that the Creator of the Universe is Himself the Author of Revelation. But it is strangely impressive to note how very little often suffices to alarm even the firmest of human faith.

Of course we cannot, in this small volume, enter upon the whole of so vast a subject, and we have therefore contented ourselves with a brief, though, we hope, sufficiently developed, discussion of one very important—even

fundamental—point. We endeavour to show, in fact, that immortality is strictly in accordance with the principle of Continuity (rightly viewed); that principle which has been the guide of all modern scientific advance. As one result of this inquiry we are led, by strict reasoning on purely scientific grounds, to the probable conclusion that "a life *for* the unseen, *through* the unseen, is to be regarded as the only perfect life." (See Chap. VII.) We need not point out here the bearing of this on religion. Incidentally, the reader will find many remarks and trains of reasoning which (by the alteration of a word or two) can be made to apply to other points of almost equal importance.

We may state that the ideas here developed—very imperfectly, of course, as must always be the case in matters of the kind—are not the result of hasty guessing, but have been pressed on us by the reflections and discussions of several years.

We have to thank many of our friends, theological as well as scientific, for ready and valuable assistance. The matter of our work has certainly gained by this, though it is likely that the manner may have suffered by the introduction, here and there, of peculiarities of style which could not easily be removed without damage to the sense.

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CHAPTER I.

INTRODUCTORY SKETCH.

"L'immortalité de l'âme est une chose qui nous importe si fort, et qui nous touche si profondément, qu'il faut avoir perdu tout sentiment pour être dans l'indifférence de savoir ce qui en est."—PASCAL.

"For he should persevere until he has attained one of two things; either he should discover or learn the truth about them, or, if this is impossible, I would have him take the best and most irrefragable of human notions, and let this be the raft upon which he sails through life—not without risk, as I admit, if he cannot find some word of God which will more surely and safely carry him."—PLATO'S *Phædo;* translated by JOWETT.

1. THE great mass of mankind have always believed in some fashion in the immortality of the soul; but it is certain that we may find disbelievers in this doctrine who yet retain the nobler attributes of humanity. It may, however, be questioned if it be possible even to imagine the great bulk of our race to have lost their belief in the soul's immortality, and yet to have retained the virtues of civilised and well-ordered communities.

We have said that the disbelievers in this doctrine form a minority of the race; but at the same time it must be acknowledged that the strength of this minority has of late years greatly increased, until at the present moment it numbers in its ranks not a few of the most intelligent, the most earnest, and the most virtuous of men.

It is, however, possible that, could we examine these, we should find them to be unwilling disbelievers, compelled by

the working of their intellects to abandon the desire of their hearts, only after many struggles, and much bitterness of spirit.

Others again, without absolutely abandoning all hope of the soul's immortality, are yet full of doubt regarding it, and have settled down into the belief that we cannot come to any reasonable conclusion upon the subject. Now, these men can have had nothing to gain, but much to lose, in arriving at this result. It has been reached with reluctance, with misgivings, not without a certain kind of persecution, nor without the loss of friends and the stirring up of strife; they have fearlessly looked things in the face, and have followed whithersoever they imagined they were led by facts, even to the brink of an abyss.

It is the object of the present volume to examine the intellectual process that has brought about these results, and we hope to show that the conclusion at which these men have arrived is not only not justified by what we know of the physical universe, but that on the other hand there are many lines of thought which point very strongly towards an opposite conclusion.

2. A division as old as Aristotle separates[1] speculators into two great classes,—those who study the How of the Universe, and those who study the Why. All men of science are embraced in the former of these, all men of religion in the latter. The former regard the Universe as a huge machine, and their object is to study the laws which regulate its working; the latter again speculate about the object of the machine, and what sort of work it is intended to produce. The disciples of How are accused by their adversaries of being willing to sacrifice the individual to the system;

[1] See *Westminster Sermons*, by the Rev. Charles Kingsley.

while the disciples of Why are accused by *their* adversaries of being willing to sacrifice the system to the individual.

We may compare the Universe to a great ship plying between two well-known ports, and carrying with her two sets of passengers. The one set keep on deck and try to make out, as well as they can, the mind of the steersman regarding the future of their voyage after they have reached that port to which they know they are all fast hastening, while the other set keep down below and examine the engines. Occasionally there is much wrangling at the top of the ladder where the two sets meet, some of those who have examined the engines and the ship asserting that the passengers will all be inevitably wrecked at the next port, it being morally impossible that the good ship can carry them further. To whom those on deck reply, that they have perfect confidence in the steersman, who has informed some of those nearest him that the passengers will not be wrecked, but will be carried in safety past the port. And so the altercation goes on; some who have been on deck being unwilling or unable to examine the engines, and some who have examined the engines preferring to remain below.

3. Our readers will perceive from what we have said, that difficulties regarding the soul's immortality are most likely to arise amidst the disciples of How or those who study the machinery of the Universe, and inasmuch as this class has greatly increased of late, it follows that the disbelievers in or doubters of the soul's immortality have increased likewise. The disciples of Why have, on the other hand, existed from time immemorial, and in the plenitude of their power have frequently carried themselves with much violence towards the disciples of How, who are of comparatively modern origin. It must not,

however, be inferred that this old and venerable family have always been at peace amongst themselves, for there have been numerous contentions between their various branches, not the less acrimonious because the contending members have been to some extent supporters of a common cause, believing in some fashion in the immortality of the soul and the reality of the world to come. We shall therefore begin by giving our readers a sketch, necessarily a very meagre one, of the various beliefs on these subjects held by the different branches of this great family.

4. Let us begin with the Egyptians, who are perhaps the most ancient people of whom we have historical records. The manners and customs of this nation have been very minutely described by Sir Gardner Wilkinson, to whose work we are chiefly indebted for the following account. In the first place it appears that we must separate between what the priests believed and what was held by the great body of the people. The bulk of the nation were left by the priests to believe in a multiplicity of deities, and even to reverence animals as divine, while on the other hand the higher orders of the priesthood, who were initiated into the greater mysteries of their religion, appear to have acknowledged the unity of God. These believed in one Eternal God, from whom all other deities were produced, and whom they did not permit themselves even to name, far less to represent under any visible form. The Egyptians likewise believed in the existence of Dæmons or Genii, who were present unseen amongst mankind—a belief apparently shared by Plato, who seems to have adopted many of the Egyptian notions, and who supposed that the deity delegated the creative power to beings inferior to himself denominated Dæmons. It may, however, be questioned

whether the Dæmons of Plato are equivalent to the Genii of the Egyptians.

5. The earliest Egyptian records attest the belief of this nation in the immortality of the soul :—"Dissolution, according to them, is only the cause of reproduction—nothing perishes which has once existed, and things which appear to be destroyed only change their natures and pass into another form."[1]

Anubis held in Egypt an office similar to that of Mercury among the Greeks, being the usher of souls in their passage to the future state. Amenti was the region to which the souls of men were supposed to go after death, and Sir Gardner Wilkinson notices the resemblance between this name and that of Ement "the West"—the west, where the sun was seen to sink, being looked upon as the end of the world. The guardian of the lower regions was called Ouom-n-Amenti, or the Devourer of Amenti. It had frequently the appearance of a hippopotamus, but was drawn sometimes with the head of a fanciful creature something between the hippopotamus and the crocodile.

"The judgment of the soul was conducted by Osiris, aided by forty-two assessors, supposed to represent the forty-two crimes from which a virtuous man was expected to be free when judged in a future state, or rather the accusing spirits, each of whom examined if the deceased was guilty of the peculiar crime which it was his province to avenge."[2]

6. As regards the fate of the soul when once the judgment had been passed upon it,—the Egyptians considered the souls of men to be emanations of the Divine soul, and each was supposed to return to its Divine origin when sufficiently pure to unite with the Deity. On the other hand,

[1] Wilkinson. [2] *Ibid.*

those who had been guilty of sin were doomed to pass through the bodies of different animals in order that they might at last become sufficiently purified. It was probably imagined that the disgusting nature of sin would be best realised by a lengthened sojourn in the bodies of unclean animals like the pig.

This doctrine of transmigration appears to have become changed, at least among some of its disciples, into the form described by Herodotus and Plato. The latter, referring no doubt to the doctrine of the pre-existence of souls, and to the view that it is a punishment to become corporeal at all, tells us :—"If any one's life has been virtuous he shall obtain a better fate hereafter; if wicked a worse. But no soul will return to its pristine condition till the expiration of ten thousand years, since it will not recover the use of its wings until that period, except it be the soul of one who has philosophised sincerely or together with philosophy has loved beautiful forms. These indeed in the third period of a thousand years, if they have thrice chosen this mode of life in succession, . . . shall in the three thousandth year fly away to their pristine abode, but other souls, being arrived at the end of their first life, shall be judged. And of those who are judged, some, proceeding to a subterraneous place of judgment, shall there sustain the punishments they have deserved; but others, in consequence of a favourable judgment, being elevated into a certain celestial place, shall pass their time in a manner becoming the life they have lived in a human shape. And in the thousandth year both the kinds of those who have been judged, returning to the lot and election of a second life, shall each of them receive a life agreeable to his desire. Here also the human soul shall pass into the life of a beast, and

from that of a beast again into a man if it has first been the soul of a man. For the soul which has never perceived the truth cannot pass into the human form."[1]

7. It is considered probable that the Egyptian custom of embalming the body had some relation to this religious doctrine, and before the mummy was allowed burial it had to be judged and acquitted by terrestrial authorities, in imitation of the judgment which was believed to take place in the world of spirits. Diodorus gives a detailed account of the ceremonies which then took place, in which forty-two judges were summoned to act as assessors and determine the fate of the body. If it could be proved that the deceased had led an evil life, his body was deprived of the accustomed burial, and on such occasions the grief and shame felt by the family were excessive. Diodorus considers that this was in itself a strong inducement to every one to abstain from crime, and praises very strongly the authors of so wise an institution.

With this we must agree, remarking however that the inducement to abstain from crime was in all probability derived more from the disgrace brought upon the family, when sepulture was refused, than from the awful sentence in the world of spirits, which this refusal was supposed to foreshadow.

8. Let us next consider the ancient belief of the Hebrew nation.

Referring to the records of this nation, we find that at an early period they had been slaves or serfs to the Egyptians, from whom they were delivered by Moses, who became afterwards their lawgiver. Moses had by a species of adoption obtained a very prominent position among the Egyptians,

[1] *Phædrus*, quoted by Wilkinson.

and had probably been initiated into their sacred mysteries, for we read that he was "learned in all the wisdom of the Egyptians." Without discussing the question of inspiration, we may readily imagine that, himself a believer in the unity of God, this sagacious leader must have perceived the deficiency of a religious system in which the truth was confined to a few, while the many were allowed to remain in the most degrading idolatry.

He was thus in a fit state to recognise the paramount importance of the whole mind and mass of the nation being pervaded with a belief in one invisible, ever-present, ever-living God. We do not, however, mean to assert that Moses got his religious notions from Egypt, but we think it possible that his mind may have been prepared by the failure of the Egyptian system to receive a better one.

9. In the Egyptian system there were two peculiarities which were probably connected together. We have seen (Art. 4.) that amongst the higher orders of the priesthood there was a profound, but at the same time a superstitious, reverence for the name of God, who was unnamed and unapproachable, unless under some deified attribute. At the same time there was, and probably in consequence of the former, an ignorance of the unity of God amongst the great mass of the people, and a worship of the various deified attributes of one supreme being as so many separate divinities.

10. Now the task that Moses believed himself divinely commissioned to accomplish was the revelation of this one living and ruling God to the whole body of his countrymen. Thus we find God, in the sacred writings of the Jews, saying to Moses, "I am the LORD (Jehovah), and I appeared unto Abraham, unto Isaac, and unto Jacob, by the name of God Almighty (El Shaddai); but by my name

Jehovah was I not known to them."[1] We do not however intend to discuss the precise meaning of the two names of God, which we find in the Hebrew Scriptures—sufficient for us that Moses endeavoured to impress upon his people the unity and ever-living presence of the Divine Being.

11. Again, it would appear that the Jews, in addition to their belief as a nation in the unity of God, believed also in the reality of an invisible world containing spiritual intelligences, some of whom were the loyal servants and messengers of God; while others delighted in the endeavour to thwart His counsels, and were in rebellion against Him. Apparently both orders of these were supposed to have very considerable power, not only over the minds and bodies of men, but also over the operations of nature. Thus two angels were commissioned by God to destroy Sodom;[2] and again, in the poem of Job, when Satan received power over the Patriarch, he overwhelmed him by at once inciting robbers who plundered his substance, killing his children by a wind from the wilderness, and finally smiting the body of Job himself with a loathsome disease.

It is perhaps worthy of note that while we read in these records of various appearances of good spirits in the human form, we have no certain account of any such manifestation of evil spirits. It may even be supposed that a good deal of the Demonology of Scripture belongs to poetic or semi-parabolic representation of spiritual truths. Thus Coleridge and others have thought that the Satan of Job is only the dramatic accuser or adversary imagined by the poet.

12. Very little is said about man's future state in the Scriptures of the Jews, and although there are a few scattered passages which favour immortality, yet these are so few

[1] Exod. vi. 3. [2] Gen. xix. 12.

that we cannot err if we maintain that this doctrine was not brought before the mind of the Hebrew nation in the same way as was the presence and unity of God. It seems to us that Dean Stanley's conjecture is probably correct where he says, with reference to this omission, "Not from want of religion, but (if we might use the expression) from excess of religion, was this void left in the Jewish mind. The future life was not denied or contradicted, but it was overlooked, set aside, overshadowed by the consciousness of the living, actual presence of God Himself. That truth, at least in the limited conceptions of the youthful nation, was too vast to admit of any rival truth, however precious. When David or Hezekiah shrank from the gloomy vacancy of the grave, it was because they feared lest, when death closed their eyes in the present world, they should lose their hold on that Divine friend with whose being and communion the present world had in their minds been so closely interwoven."[1] It ought, however, to be borne in mind that all along the Jews believed in Hades (Sheol), of which there are numerous proofs throughout the Old Testament. Indeed a learned Hebraist has assured us that the Hebrew word for the abstract notion "life," whenever it refers to a rational being, is a *pluralis tantum*, "Ḥayim," while the word for the abstract notion "death" is a singular, "maveth," thus establishing by the very character of the language the existence among the people of the belief in more than one condition of life.

13. As the nation grew older we find frequent and distinct allusions indicating a belief in a resurrection of some kind. Thus we find the angel saying to Daniel, "Go thy way till the end be; for thou shalt rest and

[1] *Lectures on the Jewish Church.*

stand in thy lot at the end of the days."[1] Again in the Apocrypha, we find one of seven brethren who were put to death by Antiochus, saying to that tyrant,—"It is good, being put to death by men, to look for hope from God, to be raised up again by Him; as for thee, thou shalt have no resurrection to life,"[2] and the other brethren spoke in like manner. Here it is evident from the whole chapter that the hope expressed was rather the result of perfect trust in God than derived from any process of their own reason, or even from any revelation on the subject which they imagined to have been made.

We have likewise the testimony of Josephus as well as of the New Testament that the Pharisees believed in a resurrection. Josephus tells us,—"They [the Pharisees] say that all souls are incorruptible, but that the souls of good men only are removed into other bodies, but that the souls of bad men are subject to eternal punishment."[3] Again, we learn from the same two authorities that the Sadducees held sceptical notions on the subject, and Josephus says—"They take away the belief of the immortal duration of the soul, and the punishments and rewards in Hades."

14. If we next turn to the Greek and Roman mythologies we find ideas of a future state very similar to those entertained by the Egyptians, from whom probably the Greek notions were originally largely derived.

They called by the name of Elysium the abode appropriated to the souls of the good, while those of the wicked suffered punishment in Tartarus. It has been well remarked by Archbishop Whately that these regions were supposed to be of the most dreamy and unsubstantial nature:—

[1] Dan. xii. 13. [2] 2 Macc. vii. 14. [3] *Wars of the Jews*, II. viii. 14.

"The poet [remarks Whately] from whom so many were content to derive their creed [meaning Homer] represents Achilles among the shades as declaring that the life of the meanest drudge on earth is preferable to the very highest of the unsubstantial glories of Elysium:—

Βουλοίμην κ' ἐπάρουρος ἐὼν θητευέμεν ἄλλῳ,
Ἀνδρὶ παρ' ἀκλήρῳ, ᾧ μὴ βίοτος πολὺς εἴη,
Ἢ πᾶσιν νεκύεσσι καταφθιμένοισιν ἀνάσσειν.

It is remarkable too that the same poet seems plainly to regard the *body* not the *soul* as being properly "the man" after death has separated them. *We* should be apt to say that such a one's body is here, and that *he*, properly the person himself, is departed to the other world; but Homer uses the very opposite language in speaking of the heroes slain before Troy: viz., that their souls were despatched to the shades, and that THEY themselves were left a prey to dogs and birds:—

Πολλὰς δ' ἰφθίμους ΨΥΧΑΣ Ἄϊδι προΐαψεν
Ἡρώων, ΑΥΤΟΥΣ δὲ ἑλώρια τεῦχε κύνεσσιν."[1]

We agree with this writer that the belief in an unsubstantial region of this description can have had no real influence either in deterring men from vice, or encouraging them to virtue. Indeed its inevitable tendency was to foster an undue regard for the pleasures of this present life to the absolute discouragement of goodness and virtue. For while we of the present day regard the future life as in some sense the reward of piety and goodness, the ancients looked upon Hades rather as a penalty which inexorable fate had reserved for all men, and from which even piety and goodness were powerless to exempt their possessors.

[1] *Essays on some of the peculiarities of the Christian Religion.*

Cum semel occideris, et de te splendida Minos
Fecerit arbitria;
Non, Torquate, genus, non te facundia, non te
Restituet pietas.
Infernis neque enim tenebris Diana pudicum
Liberat Hippolytum;
Nec Lethæa valet Theseus abrumpere caro
Vincula Pirithöo.

15. The active-minded as well as the gross-minded members of the community could hardly be expected to care much for such an unsubstantial future, and this consideration may probably have led to the readier acceptance of the doctrine of some of the Greek philosophers who introduced a bodily state after death. But these, in so doing, rather favoured the doctrine of transmigration than that of a resurrection of the body which was seen to die, and which, after being devoured by dogs, or destroyed in some other manner, they could hardly conceive to rise again. It is well known that Pythagoras taught the doctrine of transmigration, although as none of his writings have come down to us we are not sure of the exact manner in which he held it. Plato also, in a passage already quoted (Art. 6) alludes to a similar doctrine which he had probably derived from the Egyptians. A certain degree of choice is here supposed to be left to the soul, and those who cannot attain to the more ethereal and refined existence, have to choose a bodily one, returning, after they have become sufficiently purified, once more into human shape.

16. As a matter of course, a dim belief of this nature gave rise to a class of philosophers who denied the possibility of a future state altogether. The advent of this school of thought was probably hastened by outward events. In the golden age of Greece a vigorous republic served to concentrate upon itself the energies of the citizens, and under these

circumstances their minds were not likely to question the truth of the national creed. While the gods smiled upon them they were content to acknowledge their active existence. It has been remarked by Schmitz, that the unfavourable political circumstances of the time may have been concerned in the rise of the Epicurean school—"thinking men were led to seek within for that which they could not find without." The gods of Epicurus, this writer goes on to remark, "consisted of atoms, and were in the enjoyment of perfect happiness, which had not been disturbed by the laborious business of creating the world, and as the government of the world would interfere with their happiness, Epicurus conceived them as exercising no influence whatever upon the world or man."

It is of such gods the poet speaks when he says—

"For they lie beside their nectar, and the bolts are hurl'd
Far below them in the valleys, and the clouds are lightly curl'd
Round their golden houses, girdled with the gleaming world
Where they smile in secret, looking over wasted lands,
Blight and famine, plague and earthquake, roaring deeps and fiery sands,
Clanging fights, and flaming towns, and sinking ships and praying hands."

The ancient Roman poet Lucretius, in his well-known poem "De Rerum Natura," has beautifully interpreted the Epicurean philosophy. Adopting like Epicurus the atomic or corpuscular theory of things, he tells his readers that the soul of man perishes along with the body, and that it is the height of folly for man to be afraid of that which may happen to him after death.

17. It is unnecessary to discuss in detail the tenets of the various Greek and Roman philosophers. A number of indefinite and sometimes contradictory expressions sufficiently betray the uncertainty of their opinions. Desirous, it may

be, to believe themselves—desirous at least that the body of their countrymen should believe in a future state, yet it is not wonderful that they should have felt strongly the difficulty of believing, or have expressed their doubts in writings which were not intended to be read by the great mass of the people.

18. Proceeding now to the extreme east, it is well known that of late years very great light has been thrown upon the ancient religions of the Brahmans, the Magians, and the Buddhists. In an admirable collection of essays by Professor Max Müller,[1] we have a good epitome of what has been accomplished by the laborious investigations of oriental scholars. We learn from these that the most ancient document is the Rig-Veda, or Sacred Hymns of the Brahmans, in which we have the religious belief of a large section of the Indo-Germanic race at a period supposed to be from 1200 to 2000 years before the Christian era. In these hymns the gods are called Deva, a word which is conjectured to be the same with the Latin Deus. "It would be easy," says Max Müller, "to find in the numerous hymns of the Veda passages in which every important deity is represented as supreme and absolute. Thus in one hymn, Agni (fire) is called 'the ruler of the universe.' . . . . In another hymn, another god, Indra, is said to be greater than all. 'The gods,' it is said, 'do not reach thee, Indra, nor men,—thou overcomest all creatures in strength.' . . . . Another god, Soma, is called the king of the world, the king of heaven and earth, the conqueror of all. . . . . Another poet says of another god, Varuna, 'Thou art lord of all, of heaven and earth; thou art the king of all, of those who are gods, and of those who are men.' . . . . This surely," remarks

[1] *Chips from a German Workshop.*

Max Müller, "is not what is commonly understood by Polytheism. Yet, it would be equally wrong to call it Monotheism. If we must have a name for it, I should call it Kathenotheism. The consciousness that all the deities are but different names of one and the same godhead, breaks forth indeed here and there in the Veda. But it is far from being general. One poet for instance says, 'They call him Indra, Mitra, Varuna, Agni; then he is the beautiful-winged heavenly Garutmat—that which is one, the wise call it, in divers manners; they call it Agni, Yama, Mâtarisvan."

19. We learn from the same author that "there is in the Veda no trace of metempsychosis, or that transmigration of souls from human to animal bodies, which is generally supposed to be a distinguishing feature of Indian religion. Instead of this we find what is really the *sine quâ non* of all real religion, a belief in immortality and in personal immortality. . . . . Thus we read, He who gives alms goes to the highest place in heaven; he goes to the gods. . . . . Again we find this prayer addressed to Soma:—

"Where there is eternal light, in the world where the sun is placed, in that immortal, imperishable world, place me, O Soma!

"Where King Vaivasvata reigns, where the secret place of heaven is, where these mighty waters are, there make me immortal!

"Where there is happiness and delight, where joy and pleasure reside, where the desires of our desire are attained, there make me immortal!"

Max Müller further remarks, that the Rig-Veda contains allusions, although vague, to a place of punishment for the wicked. "The dogs of Yama, the king of the departed, present some terrible aspects, and Yama is asked to protect

the departed from them. Again, a pit is mentioned, into which the lawless are said to be hurled down, and into which Indra casts those who offer no sacrifices."

20. A religion like this, however pure at its commencement, was likely soon to become corrupted. It soon merged into idolatry and polytheism, as far at least as the main body of the worshippers were concerned, while at the same time the rule of the Brahmins or officiating priests became strengthened into an insupportable social tyranny. Thus a double reformation was to be apprehended, corresponding on the one hand to the religious, and on the other to the ceremonial and social, development of the system.

21. The first reformation was that attributed to Zoroaster and his disciples, whose belief is contained in the Zend-Avesta. In his confession of faith, the disciple of the Eranian or Zoroastrian religion declares, "I cease to be a worshipper of the daêvas."

It must however be remembered that in this religion *daeva* means *devil*, or evil spirit. Thus the earliest forms of the Zoroastrian religion need not have excluded, and apparently did not exclude, the worship of good spirits.

Whilst the Zoroastrian disciples believed in a supreme God who rules the world, they yet gave a prominent place to a spirit of evil, which afterwards received the name of Ahriman, and was supposed to exercise very considerable influence over the order of nature and the minds of men. Indeed, Ahriman is apparently an independent power so strong that but for the fact that he acts before he thinks, while Ormuzd (the good spirit) thinks before he acts, the victory of good would be doubtful. The whole system hinges on this and on the fact that everything noxious and evil in creation is the work of Ahriman.

Max Müller is of opinion that "the Zoroastrian religion was founded on a solemn protest against the whole worship of the powers of nature involved in the Vedas;" and again the same writer says, "The characteristic change that has taken place between the Veda and Avesta is, that the battle is no longer a conflict of gods and demons for cows (alluding to a Vaidik myth), nor of light and darkness for rain. It is the battle of a pious man against the power of evil."

22. The disciples of the Zoroastrian religion believed in a future state; the ill-speaker (the devil), we are told in the Zend-Avesta, shall not destroy the second life.

The following extracts given by Max Müller from a catechism of the modern Parsis or disciples of Zoroaster give us a very good idea of their present creed :—

"Q. Whom do we of the Zarthosti community believe in?

"A. We believe in only one God, and we do not believe in any besides Him.

"Q. Do we not believe in any other God?

"A. Whoever believes in any other God but this is an infidel, and shall suffer the punishment of hell."

In another extract the disciples are told that in the world to come they shall receive the return according to their actions.

23. The next reform of the Brahminical system had reference to its social characteristics, and was occasioned by the insupportable tyranny of the priesthood. The reformer, a young prince, was born about 500 years B.C., and from his life and doctrines received the name of Buddha, or the Enlightened. After having learned from various famous Brahmans, he came to the conclusion that their austerities and doctrines could neither free men from the miseries of this life nor from the fear of death. From this stage

Buddha passed into the belief that all we see is vanity—a delusion, a dream—and that the highest wisdom consists in perceiving this, and in desiring to enter into Nirvâna, or, in other words, to be blown out like a flame.

It would seem from these words that Buddha himself regarded annihilation rather than immortality as the *summum bonum;* but no account of Buddhism would be satisfactory which did not pay special regard to the notion so widely diffused in heathenism, that matter is the source of all evil. To be liberated from *matter* is to be liberated from *evil;* and this would seem to be the fundamental thought in the Nirvâna in all its different senses. But however this may be, we know that, allied to these extreme metaphysical opinions, Buddha inculcated a moral code which is one of the purest the world has ever known. M. Laboulaye says, "It is difficult to comprehend how men not assisted by revelation could have soared so high;" and M. Barthélemy Saint-Hilaire does not hesitate to assert, "that with the sole exception of Christ there is not amongst the founders of religion a more pure or touching figure than that of Buddha."

24. In process of time, among the followers of the Buddhist religion, the word Nirvâna came to have a very different meaning from that which it had at first. Buddha was himself worshipped as a divinity, and his Nirvâna came to denote a state in which there was a total absence of pain, or in other words an Elysium.

In illustration of this we may quote the account given by Max Müller of the dying words of Hiouen-thsang, a famous pilgrim from China to the shrine of Buddha, who died in the year of our era 664 :—

"I desire," he said, "that whatever merits I may have

gained by good works may fall upon other people. May I be born again with them in the heaven of the blessed, be admitted to the family of Mi-le, and serve the Buddha of the future who is full of kindness and affection. When I descend again upon earth, to pass through other forms of existence, I desire at every new birth to fulfil my duties towards Buddha, and arrive at the last at the highest and most perfect intelligence."

25. Having thus surveyed, however imperfectly, the belief regarding a future state held by the greater nations both of the East and West before the advent of Christianity, let us now make a few observations.

In the first place, there are manifestly two ways in which such a belief may be held. In one of these it becomes the natural result of an implicit faith in God and his goodness, which will not suffer him to disappoint the natural and innate longings of his intelligent creatures. And such a belief is more likely to arise amongst a nation which has already vividly realized the living presence and goodness of God. Now the ancient Jews were such a nation, and the belief that even death cannot break the fellowship of the believer with God comes out clearly enough in several Psalms. Moreover, the notion of some sort of future life lies clearly in what is said of Enoch. All this goes beyond the mere notion of Sheol, which is not thought of as a happy place. But in the time of the Maccabees this had grown into a definite belief in the resurrection, and without insisting on the truthfulness of the Second Book of Maccabees as an historical document, we may yet be sure that it has embodied the feelings of the Jewish nation. It is of little consequence whether a mother and seven brethren were actually put to death because they would not trans-

gress what they believed to be the laws of God, or whether in dying they expressed their belief that they would be continued in a bodily existence by the Creator. For it is manifest from what we know of the Jews, that not merely one family but many would under similar circumstances have acted in the manner described by the historian, dying with the same fortitude and encouraged by the same hope. We have here a region in which there is no thought of the How—this troublesome question has not yet arisen, nor is it likely to arise. No doubt has yet been entertained regarding the power of God, nor would such a doubt be likely to receive much encouragement here.

26. But the human mind will not refrain from speculation, and this brings us to the second method in which a belief regarding a future state may be held. It may be held after a mode determined by speculations regarding the possible conditions of a future state. Such speculations may of course take every variety of form, but yet there are three well-defined classes into which they naturally group themselves :—

In the first place, we have the doctrine of an ethereal state, which may or may not be eternal ;

Secondly, we have the doctrine of a bodily existence, which may or may not be eternal ; and,

In the third place, we have the doctrine that a future state is inconceivable or impossible.

27. The first of these beliefs was probably held by a portion of the Egyptians, Greeks, and Romans, and by most of the Jews. It was likewise held by many amongst the eastern nations. It formed indeed one of the two ways of imagining a future state, but it was of a very vague and dreary nature ; and from the passage of Homer already

quoted (Art. 14), we realize the longing supposed to be felt by the inhabitants of such a place to escape into a more substantial region. Unquestionably it was not a place in which practical men like the Jews, for instance, would wish to dwell, and yet no doubt it had great attraction for minds of a visionary and ecstatic nature, who held matter to be the source of evil.

The return of the soul to its divine original, an Egyptian doctrine, the entrance into Nirvâna, proclaimed by Buddha, and the absorption into Buddha himself, proclaimed by some of his followers, are all proofs that a doctrine of this nature has peculiar fascinations for a dreamy order of minds. Nor must we analyse too rigidly the exact meaning and tendency of such doctrines, inasmuch as we cannot easily enter into the real feelings of those who propounded them, and who probably entertained conceptions which cannot adequately be clothed in words.

28. Coming now to the belief of a bodily existence, it is remarkable that the doctrine of a transmigration of souls was extensively prevalent amongst all the nations we have named, if we except the Jews. It was believed in, as we have seen, by a large class of the Egyptians; it was introduced into Greece by Pythagoras and his followers; it is considered to have been from time immemorial a common property of the various religions of the extreme East; and it is recorded by Cæsar that the Druids believed in the same doctrine, although they confined the transmigration to human bodies.

It will perhaps surprise many of our readers to learn the extensive prevalence of such a doctrine, wondering as they must how it is possible to attach certainty to an existence which passes through the body of various men and animals

—something perhaps like a draught of Lethe being administered at the moment of passage. But the ancients, being unable to rise to a higher conception of a bodily future, were compelled either to admit this doctrine or one yet more absurd, namely, that the *very same body* which was laid in the tomb will once more be animated by the spirit which formerly possessed it. It does not therefore surprise us that the ancients, with the exception probably of a portion of Egypt, and some of the Jews, should have preferred the doctrine of transmigration; but we are exceedingly surprised that the other alternative doctrine, of manifestly Egyptian parentage, should have come to be accepted by the modern nations of Europe under the garb of Christianity. We shall return again to this subject, but meanwhile let us observe that, when men first began to ask the How of a future state, the reply was something extremely vague and unsatisfying. No wonder, then, that a class of men who had not unlimited confidence in God, and who could not believe in either of the doctrines of a future state, should have lapsed into philosophical infidelity and denied the immortality of the soul altogether.

29. We have thus arrived at a stage of development in which we may imagine the next step to be one which will throw some light upon this same question of How—that will give, or at any rate profess to give, some information regarding the conditions of a future life. The intellect of man had attempted to obtain such knowledge for itself, but the result was a conspicuous failure; the sword was not sharp enough, nor the arm which wielded it powerful enough, to hew down the thick and seemingly impenetrable barrier which fringes the avenue to the world of spirits.

"We cannot go to them," was the unanimous wail of the

ancient philosophers, till some of the more hopeful of them suggested as an alternative that they might come to us. For clearly, if A and B are separated from each other by a barrier, and there yet remains good-will between them, two courses are possible, and only two, if they are to be made acquainted with each other. If A is so weak as to be unable to overleap the barrier, and if at the same time it would be a matter of importance to him to become better acquainted with B, then B may be expected to surmount the barrier if it be surmountable, and exhibit himself to A.

30. As a matter of history, it appears that about the time of the birth of Christ there was an expectation, however vague, that something of this nature was about to take place. And when Christ made His appearance, and gathered round Him a little band of disciples, there can be no doubt that He claimed to be the bearer of intelligence from the world of spirits. Those who differ from one another as to the light in which they regard His person and doctrine will yet, we think, agree in this. The claim made by His disciples for His gospel was that it brought life and immortality to light (see Whately's Essays), and the grounds of the claim were built upon the belief that Christ had risen from the dead, and showed Himself after his resurrection to a body of men who had not previously believed that the Messiah Himself was to die and rise again.

His disciples in fine took His resurrection for a proof that life is possible after death. Christ was believed to be the first-fruits of a system that was destined ultimately to embrace in the same glorious immortality all those of His disciples who were united to their Master by a sincere and living faith. Evidently Paul attached much importance to the fact of Christ's resurrection, for he says (1 Cor. xv. 14),

"If Christ be not risen, then is our preaching vain, and your faith is also vain. Yea, and we are found false witnesses of God: because we have testified of God that he raised up Christ; whom he raised not up, if so be that the dead rise not. For if the dead rise not, then is not Christ raised: and if Christ be not raised, your faith is vain; ye are yet in your sins."

31. Let us now try to ascertain what sort of future state was taught by Christ. In the first place, it was a bodily state—a state which could even adapt itself with some modification to the views of the Pharisees who believed in the resurrection of the body. But the modification introduced is sufficiently important. The occasion of its announcement was a disputation with the Sadducees, who attempted to perplex Christ by stating to Him the case of a woman who had been married in this life to seven brethren in succession, and then asking Him whose wife she should be in the resurrection. We are told (Matthew xxii. 29) that in reply to the question, "Jesus answered and said unto them, Ye do err, not knowing the scriptures, nor the power of God. For in the resurrection they neither marry nor are given in marriage, but are as the angels of God in heaven." We may gather by implication from this narrative, that the question would have puzzled the Pharisees, who had certainly not arrived at this idea of the resurrection state.

They must evidently have thought that the resurrection body was to be similar to the present one, and although they believed in the existence and occasional appearance of angels, they cannot have risen to the idea that it was possible for man to reach a similar state after death.

32. It may perhaps be said that many of Christ's sayings would seem to lead towards the doctrine of a resurrection of the very same particles which are laid in the grave. To this, however, it may be replied that Christ undoubtedly wished to impress upon His hearers, who were for the most part unlearned and ignorant men, the substantial and bodily reality of the future state, and therefore spoke in plain language without entering into scientific minutiae, which would only have perplexed them, and diminished the impression which His words were otherwise calculated to produce. Few of His hearers would trouble themselves about the mode, nor was it until an objection was started by the learned Sadducees that Christ took occasion to develop His doctrine. In accordance with this view we see that a similar difficulty must have occurred more than once in the life of Paul, who was brought into contact with the philosophy of Greece and Rome. For in one of his Epistles[1] he asks the question,—How are the dead raised up? and with what body do they come? He then replies to the supposed objector in the following noble and beautiful language:—"There is one glory of the sun, and another glory of the moon, and another glory of the stars; for one star differeth from another star in glory. So also is the resurrection of the dead; it is sown in corruption, it is raised in incorruption: it is sown in dishonour, it is raised in glory: it is sown in weakness, it is raised in power: it is sown a natural body, it is raised a spiritual body. There is a natural body, and there is a spiritual body."

33. In the next place we remark, that this conception of a spiritual body similar to that of the angels is accompanied in the religious system of Christ by a conviction that

[1] 1 Cor. xv. 35.

the present visible universe will assuredly pass away This is expressed in both divisions of the writings acknowledged as sacred by the disciples of Christ. Thus it is said :—"Of old hast thou laid the foundation of the earth ; and the heavens are the work of thy hands. They shall perish, but thou shalt endure ; yea, all of them shall wax old like a garment : as a vesture shalt thou change them, and they shall be changed."[1] Again, Paul tells us that "the things which are seen are temporal, but the things which are not seen are eternal."[2] Likewise also Peter says—"The day of the Lord will come as a thief in the night ; in the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat ; the earth also, and the works that are therein, shall be burned up. . . . Nevertheless we, according to his promise, look for new heavens and a new earth, wherein dwelleth righteousness."[3] In like manner John tells us that he saw in a vision "a great white throne, and him that sat on it, from whose face the earth and the heaven fled away ; and there was found no place for them."[4]

From all this we may conclude that the more advanced disciples of Christ supposed the resurrection body to be angelic in its nature, and similar to that which they believed Christ had himself assumed ; and further, that they supposed this body would remain when the present visible universe had passed away.

34. We have already remarked that it was the object of Christ to bring the future state in a very vivid manner before His disciples, so that they might realize its substantial existence, and He has accordingly given them on the one hand exalted descriptions of the joys of heaven, and on the

[1] Psalm cii. 25. [2] 2 Cor. iv. 18. [3] 2 Peter iii. 10. [4] Rev. xx. 11.

other awful accounts of the place of torment. Heaven was variously described as a banqueting house, as a beautiful city, as Abraham's bosom, and, when speaking to His immediate disciples, as a place where they shall dwell together with their Master. On the other hand, it is believed that Christ's description of hell was borrowed from the valley of Hinnom, a place near Jerusalem, which formed the receptacle for every species of filth, the combustible parts of which were consumed by fire. Putrefaction, or the worm, was always busy there, and the fire was always burning, and this may have given rise to the expression: "Where their worm dieth not, and the fire is not quenched." There can be no doubt, we think, that such descriptions were meant to be allegorical, the intention being by forcible earthly images to convey an idea of what could not otherwise be conveyed.

35. It is well known that many varieties of opinion have been entertained regarding the person of Christ even by those who profess to be His disciples. It is not however here our object to enter into theological controversies; our treatment of this subject is at present historical, and we will therefore bring before our readers the views held by the large majority of those who call themselves Christians regarding the person of Christ and the constitution of the invisible world.

Whilst all the Christian Churches believe in one God, yet by most of them the Godhead is believed to consist of three persons, the Father, the Son, and the Holy Ghost. The first of these appears to be regarded as the Being or Essence in virtue of whom the Universe exists. Thus in reciting the Apostles' Creed the Christian disciple says:— "I believe in God, the Father Almighty, maker of Heaven and Earth;" and the laws of the Universe are regarded by

Christian theologians as being expressions of the will acting in conformity with the character of this Being. Thus Nature (according to Whately) is the course in which the Author and Governor of all things proceeds in his works.

But, in addition to this, the majority of Christian Churches virtually assert that we have, besides man and an invisible hierarchy of angels, two Divine Persons, who work through and by the Universe. One great object of the second Person of the Trinity is held to be the manifestation of God to man, and possibly to other beings, in a manner and to an extent which could not be accomplished by finite intelligences. One great object of the third Person again is to enter, as Lord and giver of life, into the souls of men, and possibly of other beings, and to dwell there in such a manner as to fit them for the position which they are destined ultimately to occupy in the universe of God.

36. In Christ it is supposed that we have an incarnation of the second Person of the Trinity, and the work which He accomplished is regarded as done not in violation of the order of things as established by God the Father, but rather in strict obedience to it. But while this is generally accepted by the Church of Christ, yet the doctrine of the submission of Christ to law has been held by some as not inconsistent with a view which regards the miraculous works of Christ as manifestations of His divine nature, so changing the order of things as to denote something wrought upon the universe rather than something wrought through it and by its means. We do not think that this theory is borne out by the words of Christ himself. He says: "I seek not mine own will, but the will of the Father who sent me."[1] Again, we are told by Paul, that "when the

[1] John v. 30.

fulness of the time was come, God sent forth his Son, made of a woman, made under the law, to redeem them that were under the law, that they might receive the adoption of sons."[1]

Christ also frequently represents His works as wrought by the Father, as for instance when he says:—"I do nothing of myself; but as the Father hath taught me, I speak these things."[2] In fine, the whole genius of Christianity would point towards a total submission of Christ in every respect towards all the laws of the universe, which, indeed, form but another expression for the will of God acting in conformity with His character. To make our meaning clear, we may say that the will of man is accomplished in conformity with the laws of the universe, while on the other hand the will of God, as above defined, constitutes in itself the laws of the universe. Now it appears to us from what we find recorded in the records of the Christian religion, that Christ must in this sense be regarded as similar to man; but, inasmuch as the relation of Christ to the universe was different from that of any mere man, so the works of Christ are to be regarded as different from those which any mere man can accomplish.

37. The Christian system, of which we have now briefly described the peculiarities, was soon called upon to do battle, on the one hand with the ancient philosophies of Greece and Rome, and on the other with the less civilised races of man, including those which were destined ultimately to overpower the Roman Empire. But it was chiefly when the apostolic pioneers came into contact with the acute minds of the ancient philosophers that we have light struck regarding what may be termed the philosophical system of Christianity; thus we have already remarked (Art. 32), that

[1] Galatians iv. 4. [2] John viii. 28.

the nature of the glorified body is most clearly given us by the Apostle Paul. As respects the more barbarous nations which afterwards embraced Christianity, *they* were not likely to puzzle themselves about the physical possibilities of a future state, nor even to contest the physical reality of a place of eternal torment. And so it happened, that when dealing with a lower class of converts, the Christian religion appealed more to their fears than to their hopes, bringing vividly before them the awful nature of hell ; while on the other hand, the higher class of converts, if they had not a very clear idea of heaven, were yet drawn with intense longing to a future which they were to spend in the company of Christ.

38. In the course of a few hundred years we find the whole Roman Empire converted to Christianity, while, however, in Arabia and the East it appears either to have made very little progress, or to have become corrupted into something very different from that which we read of in the New Testament. It had not become the national religion of the Arabs; and we can well imagine that this nation, with their pretensions to be regarded as the most ancient representatives of the Semitic race, would not look kindly upon a religion that took its origin in a rival branch of the same family. We can further imagine that, with such a feeling, they would be very ready to welcome a religious system that should spring up amongst themselves. Such an opportunity was afforded them by Mohammed. Acknowledging in some measure the claims of Moses and Christ, Mohammed yet claimed for himself and his religion a superiority over his rivals, flattering by this means the vanity of his own countrymen, who considered themselves the elder branch of the Semitic race. The heaven that was promised by

Mohammed was altogether of a sensuous character, and well calculated to strike the imagination of his disciples. He succeeded equally well in describing hell as a place of torment reserved for those who did not believe in his religion. He further commissioned his followers to propagate his tenets by the sword, so that men became converts from dread of earthly punishment, and were retained in his ranks by the success which attended his arms, and by the promise of a paradise that was full of earthly delights, as well as by the threat of a hell which was reserved for unbelievers. We could not possibly have a better or more graphic description of such a system than that which is given us by Byron :—

"But him the maids of paradise
Impatient to their halls invite,
And the dark Heaven of Houris' eyes
On him shall shine for ever bright;
They come—their kerchiefs green they wave,
And welcome with a kiss the brave!
Who falls in battle 'gainst the Giaour
Is worthiest an immortal bower.
But thou, false Infidel! shalt writhe
Beneath avenging Monkir's scythe;
And from its torment 'scape alone
To wander round lost Eblis' throne,
And fire unquench'd, unquenchable,
Around, within, thy heart shall dwell;
Nor ear can hear nor tongue can tell
The tortures of that inward hell!"

The disciples of Mohammed believed in the unity of God, but it is evident that they had not a very exalted conception of his character. Their trust in him could infuse zeal into their hearts and vigour into their arms when they went to make proselytes by the sword, but could not produce

that lofty type of character which has so frequently appeared amongst the followers of Christ.

39. We have now reached in the history of our problem the period known as the dark ages, during which the spirit of scientific inquiry was well-nigh extinct. At length, however, there arrived a time when the human mind, from a variety of causes, suddenly awoke from the lethargy into which it had sunk.

When scientific thought was once more directed to the subject of immortality, it was easily seen that the doctrine of the resurrection in its vulgar acceptation could not possibly be true, since a case might be imagined in which there might even be a contention between rival claimants for the same body. We might, for instance, imagine a Christian missionary to be killed and eaten by a savage, who was afterwards killed himself. It is indeed both curious and instructive to note the reluctance with which various sections of the Christian Church have been driven from their old conceptions, and the expedients, always grotesque, and sometimes positively loathsome, with which they have attempted to buttress up the falling edifice. Some deem it necessary that a single material germ or organised particle of the body at death should survive until the resurrection, forgetting that under such an hypothesis it would be easy to deprive a man of the somewhat doubtful benefits of such a resurrection, by sealing him up when yet alive in a strong iron coffin, and by appropriate means reducing the whole into an inorganic mass. Boston, again, in his *Fourfold State*, goes still further, adopting the idea that a single particle of insensible perspiration which has escaped from us during life, will be sufficient to serve as a nucleus for the resurrection body. So that according to the

disciples of this school, the resurrection will be preceded by a gigantic manufacture of shoddy, the effete and loathsome rags of what was once the body being worked up along with a large quantity of new material into a glorious and immortal garment, to form the clothing of a being that will live for ever! Unquestionably we have continuity in this hypothesis, but it is the continuity of the Irishman's coat in the story, the owner of which always made a point of retaining as many as possible of the rags that were present on the last occasion, those only which had absolutely fallen to pieces being replaced by something new! We have only to compare this hideous and grotesque conception with the noble and beautiful language of Paul, to recognise the depth of abasement into which the Church had sunk through the materialistic conceptions of the Dark Ages.

40. But it is needless to say that this very liberal offer of a certain class of theologians to surrender everything except a single shred of the worn-out body was nevertheless rejected by the school of scientific men. Death, they replied, must be regarded as a total and complete destruction of the visible body as far at least as the individual life is concerned. At the same time professing themselves unable to conceive such an existence as a disembodied spirit, they were forced to conclude like Priestley,[1] that the soul in its nature is not immortal. At this point, however, the scientific school splits up into two or even three sections, one believing with Priestley and others that immortality is a fresh and miraculous gift conferred upon man at the resurrection; another, unable to conceive the possibility of a miracle in the case of each individual, denying a future state altogether; while a third section maintains that there

[1] See Professor Huxley's Birmingham Lecture.

is no use in discussing the subject, because man after death has passed beyond the sphere of human inquiry.

41. Regarding the existence and nature of the Deity, various opinions have been entertained by the disciples of what we may term the extreme school of science. Some have maintained that we have no evidence of the existence of any such Being, others that we have no evidence of His personality, while others argue that although we may become convinced of His great power and wisdom from the works of creation, there are other attributes of His character which are not so revealed. We cannot, for instance, say they, maintain the benevolence of the Deity in the way in which we understand the word benevolence, nor have we any evidence that He is just in the way in which we understand the word justice. It is well known that the late John Stuart Mill would have regarded the claims of Christianity with more favour had its character been more Manichæan, that is to say, had the spirit of evil been allowed a position more nearly equal to that of the spirit of good in the government of the universe.

42. Let us here pause to indicate two points of similarity between the scientific school and the system of Christianity. Both, we conceive, maintain in some sense the supremacy of law or the invariability of the procedure adopted by the Deity in the government of the universe (Art. 36); both maintain likewise that the outer works of the visible universe are insufficient to manifest certain attributes of the Deity. Here, however, the likeness ends; the scientific school conceive they have no information beyond the visible universe, while the Christian system asserts the existence of an invisible order of things, and the fact of communications having taken place between the two for the purpose

of revealing God to man, and of raising man towards God.

43. Leaving now the views of those who may be said to constitute the extreme left, let us shortly consider the various opinions held regarding a future state by those who yet rank themselves within the pale of Christianity. Not a few who revere the sacred writings, believe nevertheless that the descriptions of the unseen world contained therein are purely allegorical.

They do not believe in the existence of evil spirits exercising an influence over the mind of man. Satan is regarded as a personification of evil (*Διαβόλος*, the accuser, Devil's advocate) rather than as possessing a real objective existence. Having thus got rid of the worst half of the unseen world, the other half follows in due course. They do not believe in the unseen presence of angels (*Ἄγγελος*, messenger); and in fine they conceive there is nothing above man but the Deity, who always acts according to rigid law. It is a step from this to believe in the futility of prayer, which is looked upon as devoid of any objective influence, although the practice of it may be regarded as possessing a beneficial subjective effect. A future life is believed to be conceivable, but only under conditions and in a universe about which we know nothing. At this point, however, the views of what may be called the left centre come into contact with those of the extreme left.

44. But there are others quite disposed to believe in the existence of the unseen world, who yet regard as figurative a large part of the Biblical descriptions. Some, like the Church of Rome, consider the separation of the souls of men after death into two categories, and only two, as insufficient and unsupported by the spirit of Scripture; while others

cannot imagine the eternity of punishment, but believe that the most reprobate will ultimately be brought back and elevated into the regions of bliss.

Others again, arguing from some expressions in the Bible, regard immortality as a boon reserved only for the good, believing that the wicked will be destroyed, both soul and body, in hell. No doubt by an energetic nature such a fate would be regarded as even worse than endless punishment:

> Sad cure! for who would lose,
> Though full of pain, this intellectual being?
> Those thoughts that wander through eternity
> To perish rather, swallow'd up and lost
> In the wide womb of uncreated night,
> Devoid of sense and motion.

So speaks Milton, putting the idea into the mouth of Belial, the fallen spirit, when addressing his peers.

45. These are a few of the ways in which the statements of Christ and his Apostles regarding immortality have been interpreted by those who call themselves Christians. But amid this great diversity there is yet one principle common to all. It is imagined that something peculiar in the history of the world took place at the coming of Christ, which has not since been repeated. Communications were then made to mankind which are regarded as unique, and the truth of which it is held will only be verified in the case of each individual when he has passed into that country from which we receive no travellers' tales.

Notwithstanding this general belief, not a few have arisen pretending to have received a new and supplementary revelation. In most of these cases the scientific his-

torian may at once come to a conclusion without any violation of his impartiality,—they are so manifestly the products of delusion if not of imposture. There is however one system which merits fuller treatment, inasmuch as it has led to a mode of viewing the spiritual world which has many followers at the present day.

46. Emanuel Swedenborg, the apostle of this system, was in many respects a remarkable man. Living more than a century ago, and during the time when Science was pausing for the spring she has since made, he seems to have foreshadowed, if he did not anticipate, many of the doctrines of the present day. We are not however now concerned with his purely physical speculations.

Swedenborg has written at great length regarding the nature and destiny of man, and the constitution of the unseen world into which he asserts he had the power of entering.

He assumes the existence of a human or semi-human race before Adam, of which he remarks that they lived as beasts. "Man," he tells us, "considered in himself, is nothing but a beast. . . . Man's peculiarity over animals —a peculiarity they neither have nor can have—consists in the presence of the Lord in his will and understanding. It is in consequence of this conjunction with the Lord that man lives after death; and although he should exist like a beast, caring for nothing but himself and his relations, yet the Lord's mercy is so great, being Divine and Infinite, that He never leaves him, but continually breathes into him His own life, whereby he is enabled to recognise what is good and evil and true and false."

Regarding man's mortal nature we are told by Swedenborg that "man at birth puts on the grosser substances

of nature, his body consisting of such. These grosser substances by death he puts off, but retains the purer substances of nature, which are next to those that are spiritual. These purer substances serve thereafter as his body, the continent and expression of his mind."[1]

"A man at death," he tells us again, "escapes from his material body as from a rent or worn-out vesture, carrying with him every member, faculty, and function complete, with not one wanting, yet the corpse is as heavy as when he dwelt therein."

Regarding the spiritual world, he tells us "that the whole natural world corresponds to the spiritual world collectively and in every part; for the natural world exists and subsists from the spiritual world, just as an effect does from its cause." He also tells us "that if in the spiritual world two desire intensely to see each other, that desire at once brings about a meeting. When any angel goes from one place to another, whether it is in his own city, or in the courts, or the gardens, or to others out of his own city, he arrives sooner or later, just as he is ardent or indifferent, the way itself being shortened or lengthened in proportion. . . . Change of place being only change of state, it is evident that approximations in the spiritual world arise from similitudes of mind and removals from dissimilitudes; and thus spaces are merely signs of inner differences. . . . From that cause alone the hells are altogether separated from the heavens."

Of God he says: "The Divine is incomprehensible even by the angels, for there is no ratio between the finite and the infinite.

"No man or angel can ever approach the Father and

[1] *Life and Writings of Swedenborg*, by William White.

immediately worship Him; for He is invisible, and being invisible can neither be thought of nor loved."

Of God's Providence he says: "As in the Lord we are and act, His Providence is over us from birth to death, and even to eternity. . . . To talk of the Lord's Providence as universal, and to separate it from particulars, is like talking of a whole in which there are no parts, or of something in which there is nothing. Consequently it is most false, a mere picture of the imagination, and downright stupidity, to say that the Lord's Providence is universal, and not at the same time in the minutest particulars; for to provide and rule in the universal, and not at the same time in the minutest particulars, is not to rule at all."

Swedenborg likewise believed in an intermediate state analogous to purgatory, although he objected to the name. This was called by him the world of spirits, after staying in which, for a longer or shorter time, the souls of the departed were drafted off to heaven on the one side, and to hell on the other.

47. We have now said enough to give our readers some idea of Swedenborg's spiritual system. Unquestionably it is the system of a profound thinker, and many great men have not hesitated to express their admiration of Swedenborg and his works. It is one thing however to admit the beauty, the philosophical completeness, and even the possible truth of many of his statements, and another thing to believe that he actually conversed with the inhabitants of another world in the way in which one man converses with another.

But, after all, suppose that the everyday experience of men is that only he who lives in the world as not of the

world lives a true life, and this is the Bible teaching,—whose then is the true doctrine? Swedenborg errs if he claims this as his *exclusive personal* experience. Paul claimed it as belonging to all men. Surely men of science should of all men claim this likewise.

Now, when a man unquestionably honest makes an assertion such as Swedenborg made, there are only two possible conclusions to which we can come, unless we choose to remain in a state of mental suspense. We must either believe that he really saw what he professes to have seen, or that he was the victim of some strange hallucination, in virtue of which his subjective impressions became transferred into the realms of objective realities. We know very well that the human mind is extremely prone to such delusions, and that the nature of the case is frequently betrayed by some indiscreet admission that we have external grounds for believing to be incorrect. Had Swedenborg confined himself to the invisible world it would have been very difficult to prove him the subject of a delusion, but when he visits the planets, and describes their inhabitants, he enters at once upon dangerous ground.

Concerning his description of the various planets it has been remarked that his visits were only paid to those, the existence of which was known when he wrote, Uranus and Neptune being passed over. This of itself is a suspicious circumstance. Again, he peoples the planets Jupiter and Saturn with inhabitants as well as our own Moon; now, scientific analogy is strongly against either of these two planets being inhabited, while it is next to certain that our moon is entirely without inhabitants.

In fine, there is no reason to suppose that the speculations of Swedenborg were anything else than the product of his

own mind, in the same sense in which the speculations of this volume may be regarded as the product of the minds of its authors.

48. Before concluding this historical sketch let us say a few words about modern spiritualists in as far as their pretensions have reference to our subject. They assert the presence among them of the spirits of the departed, assuming sometimes a visible shape, and they compare these appearances to those which are recorded in the Sacred writings. But there is this prominent distinction between the two: the spiritual communications recorded in the Scriptures are represented as made to those who were unprepared to receive them, and also for the most part as taking place in open daylight, or, to speak more properly, having no sort of reference to light or darkness. Whatever be their explanation they have an open-air look about them. On the other hand, the manifestations recorded by the spiritualists take place as a rule in insufficient light, if not in total darkness, and in presence of those who are in a state of mental excitement.

Now, for our own part, we should not be disposed to credit any communication from the world of spirits that was not made in open daylight, and to those unprepared to receive it, and therefore unprejudiced.

The man of science must be perfectly recipient, but he must in the interests of truth guard himself against the possibility of delusion. We know the almost infinite power of the mind not only to delude itself, but to propagate its delusions to the minds of others, and, as we have already remarked, the conditions of these manifestations are favourable to the spread of such delusions. We do not therefore hesitate to choose between the two alternative

explanations, and to regard these pretended manifestations as having no objective reality.

49. But while we altogether deny the reality of these appearances, we think it likely that the spiritualists have enlarged our knowledge of the power that one mind has in influencing another, which is in itself a valuable subject of inquiry. We agree too in the position assumed by Swedenborg, and by the spiritualists, according to which they look upon the invisible world not as something absolutely distinct from the visible universe, and absolutely unconnected with it, as is frequently thought to be the case, but rather as a universe that has some bond of union with the present.

This line of argument will be developed in the following chapters of our book.

CHAPTER II.

POSITION TAKEN BY THE AUTHORS—PHYSICAL AXIOMS.

"We have but faith: we cannot know;
For knowledge is of things we see;
And yet we trust it comes from thee,
A beam in darkness: let it grow."—*Tennyson.*

50. In the preceding chapter we have given a very brief epitome of the various beliefs regarding immortality and the invisible world held by the civilised nations of the earth, from the earliest dawn of history to the present day. It is now time to say something about the object of this book, as well as to define the position from which we mean to start in pursuance of this object. We shall therefore commence by dividing those who concern themselves about our theme into three great classes.

In the first place, we have those who are so absolutely certain of the truth of their religion, and of the immortality which it teaches, that they are not qualified to entertain or even to perceive any scientific objection. They acknowledge that certain deductions made by men of science appear to contradict the truth of their religion. But these they regard as premature conclusions, averring that when the laws of nature have been more deeply investigated, there will be found a perfect concord between science and revelation. Certain scientific truths they readily assent to, and it is only the altogether human superstructure of speculation

built upon these that they profess to question. "You have built," they say, "upon the rock of truth a structure of wood, hay, stubble, and you wish to persuade us that it is the very temple of God. We will not enter it, but will patiently wait in the expectation of seeing it speedily consumed with fire."

Now, whatever be the merits or demerits of such men, it is not for them we write. Their merit may consist in having made a perfectly true charge against certain classes of scientific men—their demerit probably in having themselves done for religion precisely the same that they accuse their adversaries of doing for scientific truth. We must let them alone—they will not be influenced by anything that we can say. We may perhaps be praised if it be thought that we have helped to overthrow the superstructure of their adversaries; we shall certainly be condemned if it be thought that we have helped to weaken any portion of that superstructure which they themselves have reared.

51. In the next place, and occupying a middle position, we have those who see strong grounds for believing in the immortality of man and the existence of an invisible world, but who at the same time are forced to acknowledge the strength of the objections urged against these doctrines by certain men of science. Some of this class attach much weight to the evidence in favour of these doctrines derived from the Christian records; others again, unable to believe in these records, are yet powerfully impressed by the universal longing for immortality which civilised man has always shown, while others attach nearly equal importance to both kinds of evidence. Nevertheless, all of the class of whom we now speak have deeply studied the scientific objections, and do not well see how to

surmount them. It is to this class that we shall especially address ourselves in the following chapters.

52. The third class of men are those of the extreme materialistic school. All human history, including the life of Christ and that which took place in connection with it, all yearnings of man for immortality, all life, from that of the noblest of human beings to that of the primordial animated germ, are explained by this class as the result of the interaction of material atoms guided by certain measurable physical forces. They have no reason to believe there is anything beyond the visible universe, and in consequence they decline entering into any argument upon the subject. Their premiss may be wrong, but their conclusion follows as a matter of course. We have examined (say they) all the evidence in favour of another universe, and find it utterly worthless, why then should we discuss the subject?—it is one of those delusions that are common to man. When a traveller pretends to have received information about some strange and distant country, our first step is to inquire whether he is a trustworthy and sane man, and if we find he is otherwise, it is quite unnecessary for us to discuss either the information which he brings, or the objections to that information. You pretend to show the scientific possibility that this information may be correct, but why should we study your argument since there is no evidence for supposing that there is any such place?

53. To these men we would reply, that even assuming their own point of view, our scheme will, we venture to suggest, be found to give a more complete and continuous explanation of the visible order of things than one which proceeds upon the assumption that there is nothing else. In this respect we may liken it to the hypothesis of atoms, or that

of an ethereal medium, for neither of which we have the direct evidence of our senses, but which have nevertheless been adopted as affording the best explanations of the phenomena of the visible universe.

54. Having thus classed our readers they will now be anxious to learn our position. Let us begin by stating at once that we assume, as absolutely self-evident, the existence of a Deity who is the Creator of all things. "We are obliged," says Herbert Spencer in his First Principles, "to regard every phenomenon as a manifestation of some Power by which we are acted upon; though omnipresence is unthinkable, yet, as experience discloses no bounds to the diffusion of phenomena, we are unable to think of limits to the presence of this Power; while the criticisms of science teach us that this Power is Incomprehensible." We further look upon the laws of the universe as those laws according to which the beings in the universe are conditioned by the Governor thereof, as regards time, place, and sensation.

It is for instance on account of these laws that we cannot be present in different places at the same time; or move over more than a certain space in a certain time; or think more than a certain number of thoughts; or feel more than a certain number of sensations in a certain given time.

And hence while we can very easily imagine an intelligence superior to ourselves, but yet finite, to be very differently conditioned, we cannot imagine any finite intelligence to be absolutely without conditions. At any rate, if finite intelligences unconditioned with respect to time and space be conceivable existences, yet they are so absolutely unconnected with the present universe, which has reference to these elements, that their existence need not be contemplated as far as the present argument is concerned.

55. It will thus be seen that we cannot conceive of purely finite intelligences existing in the universe without some sort of embodiment; but we now come to a point which deserves a somewhat fuller discussion. We can imagine the materialists saying to us: You are right in asserting the inconceivability of such intelligence as that of man existing without some sort of embodiment, or to speak plainly, without some association with matter—that is precisely the view we ourselves take. But, on the other hand, *we* can very well conceive of matter existing without intelligence, as for instance a block of wood, or a bar of iron.

Thus the connection between these two things, matter and mind, is of such a nature, that mind cannot exist without matter, while matter can and does exist without mind.

Is there not therefore a reality about matter which there is not about mind? Can we conceive a single particle of matter to go out of the universe for six or eight hours and then to return to it; but do we not every day see our consciousness disappearing in the case of deep sleep, or in a swoon, and then returning to us again? Far be it from us to deny that we have something which is called consciousness, and is utterly distinct from matter and the properties of matter, as these are regarded in Physics. But may not the connection between the two be of this nature?—When a certain number of material particles, consisting of phosphorus, carbon, oxygen, hydrogen, nitrogen, and perhaps some others, are, in consequence of the operations of their physical forces, in a certain position with respect to each other, and in a certain state of motion, consciousness is the result, but whenever this connection is brought to an end, there is also an end of consciousness and the

sense of individual existence, while however the particles of phosphorus, carbon, etc., remain as truly as ever.

56. Now this means that matter must be looked upon as mistress of the house, and consciousness as an occasional visitor whom she permits to take of her hospitality, turning him out of doors whenever the larder is empty. It is worth while to investigate the process of thought which gives rise to this curious conception of the economy of the universe.

It is clear that certain arrangements are made in the universe, in virtue of which similar sensations are produced simultaneously in different individuals, while in other arrangements the sensations produced are the peculiar property of some one individual. The one set have come to be associated with objective realities, while the other set are concerned with subjective impressions. I am affected by a pain in my head, and I am also affected by the sun, but the one affection is the peculiar product of my brain, and I carry it about with me, while experience has shown me that I cannot appropriate the other; yet it also becomes mine so soon as it has reached my brain.

It will further be allowed, that there are certain material particles which may become vehicles for both of these kinds of sensations, while there are others that have only the power of producing one. Gold, silver, and platinum are substances which may become the vehicle of common impressions, but not of peculiar impressions, since they do not occur in our brains. Phosphorus, on the other hand, is a substance which may become the vehicle of both kinds. When we burn a piece of phosphorus in a lecture-room it is the vehicle of a common impression, while the phosphorus in our brain is the vehicle of a peculiar impression. Now there is this difference between portions of phosphorus playing these

two parts. When in the common state, we can experiment upon it and investigate its properties, but this we cannot do when it exists in the brain in its peculiar state. The assertion, therefore, that phosphorus and its allied particles, whose motions and positions are accompanied by consciousness, are nevertheless, when in this state, essentially the same as they are in the ordinary state, appears to us to be without foundation. We cannot thus argue from the one state to the other. For that most peculiar and interesting condition of phosphorus and other matter in which it is intimately connected with the production of consciousness, and where some peculiarity due to this connection might perhaps be thought likely is the very thing we cannot investigate. To say therefore that the brain consists of particles of phosphorus, carbon, etc., *such as we know them in the common state*, and that when the particles of the brain have, in consequence of the operation of physical forces, a certain position and motion, then consciousness follows, is to assign a peculiar relation between the brain-particles and consciousness which we are not justified in doing.

57. Allied to this assumption there is another in the materialistic argument as we have stated it. If in the body there be no other material than the visible particles, and in the brain no other material than a certain quantity of phosphorus and other things, such as we know them in the common state, and if consciousness depends upon the structural presence of these substances in the body and brain, then when this structure falls to pieces there are of course reasonable grounds for supposing that consciousness has entirely ceased. But it is the object of this volume to exhibit various scientific reasons for believing that there is something beyond that which we call the visible universe.

58. There remains yet that part of the argument which hints that consciousness is less permanent than matter, inasmuch as individual consciousness frequently departs from the universe for six or eight hours and then returns to it again. In one sense this is unquestionably true, while, however, there is a potential or latent consciousness or possibility of consciousness that remains behind. It will be seen in the sequel that this fact of latent consciousness will be used by us to strengthen our argument in favour of a future state.

59. We may conclude, as the result of this discussion, that the connection between mind and matter is a very intimate one, although we are in profound ignorance as to its exact nature.

The intimacy of this connection is a doctrine almost universally held by modern physiologists. Just as no single action of the body takes place without the waste of some muscular tissue, so, it is believed, no thought takes place without some waste of the brain. Nay, physiologists go even further, and assert that each specific thought denotes some specific waste of brain tissue, so that there is some mysterious and obscure connection between the nature of the thought and the nature of the waste which it occasions. In like manner memory is looked upon as dependent upon traces, left behind in the brain, of that state in which it was when the sensation remembered took place. Thus Professor Huxley in his Belfast address (1874) tells us: "It is not to be doubted that those motions which give rise to sensation leave on the brain changes of its substance which answer to what Haller called '*vestigia rerum*,' and to what that great thinker David Hartley termed 'Vibratiuncules.' The sensation which has passed

away leaves behind molecules of the brain competent to its reproduction—'sensigenous molecules,' so to speak—which constitute the physical foundation of memory."

60. It will be inferred from what we have said that one of the essential requisites of continued existence is the capability of retaining some sort of hold upon the past, and, inasmuch as we are unable to contemplate such a thing as a finite disembodied spirit, it is further evident that this hold implies an organ of some sort. This we conceive to be a perfectly general proposition. We do not limit ourselves in making it to any particular arrangement of bodily form, or to any particular rank of finite organised intelligence. From the archangel to the brute we conceive that something analogous to an organ of memory must be possessed by each.

61. But if one general requisite of life be a connection with the past, another is the possibility of action in the present. A living being must have in his frame the capacity of varied movement. He must possess a bodily organisation in which there is the power of calling internal forces into play at irregular intervals dependent on his will. We cannot imagine life to be associated with a motionless mass or with a mass which moves in an invariable manner.

The living being need not always be in motion, but he must retain the capacity of moving. He need not always be thinking, but he must retain the capacity of thought.

To sum up—it thus appears that there are two general conditions of organised life. There must in the first place be an organ connecting the individual with the past, and in the next place there must be such a frame and such a universe that he has the power of varied action in the present. We particularly request our readers to keep well in mind

these two propositions, since it is upon these that our argument will ultimately be built.

62. We come now to a very important part of our inquiry. It will be necessary to discuss the Principle of Continuity, and desirable to begin by defining exactly what is meant by us when these words are used.[1] Let us illustrate this by an example.

Let us take a particular problem, that of astronomy, for instance, and, beginning at the very commencement, let us suppose an early Egyptian or Chaldean astronomer to be observing the sun in the middle of summer. Day after day, for perhaps a week, he has noticed that this luminary rises over a certain place and sets over a certain other place, and he conceives that he has now obtained some definite information regarding the sun. His idea is, that the sun will always go on doing the same thing, and he therefore predicts to his fellows, who are less observant than himself, exactly where it will rise and where it will set. They join him in observing the luminary for a week or more, and the sagacity of our primeval astronomer is triumphantly vindicated: the sun is found doing as nearly as possible that which had been predicted of it.

63. These men have now got hold of the idea that the sun will always rise and set at the same places, that in fact his daily journey is always the same, and that he performs it in the same time. But in the course of six months they suspect they are mistaken. Discredit is thrown upon the sagacity of our astronomer, and he broods over his disgrace for six months longer. At the end of this time, on turning his eyes towards the sun, what is his surprise

[1] See Essay on this subject by the Honourable Sir W. R. Grove, in his book on *The Correlation of Physical Forces.*

and delight to find that luminary doing the very thing that he had all along predicted, returning once more to his old points of rising and setting,—places, we may presume, that could easily be remembered on account of some peculiarity of landscape. He is not yet prepared however for a higher generalisation, but again calls for his fellows, and while he suspects a certain amount of irregularity in the sun, yet succeeds in convincing them that his guess was after all not far from the truth. Once again he is reinstated in their good opinion.

64. However, six months after, precisely the same thing recurs once more; the rising and setting points are now considerably different from those predicted. Our astronomer again loses credit, and regains it only partially six months afterwards, when the points are once more right. But he has now learned a lesson. He perceives a method in all this, and ultimately rises, by means of the difficulty, to a higher generalisation. He sees that the rising and setting points of the sun come back to their original position in about 365 days; and he has thus learned, in a rude way, that the sun has two motions, one of which he accomplishes in 24 hours, or one day, while the other has a period of 365 days, or one year.

65. While these things are in progress, a portentous and wholly unexpected event takes place: the sun for four minutes is totally extinguished. Our astronomer meditates much on this strange phenomenon, and is inclined to regard it as a triumph of the powers of Darkness, in personal conflict with those of Light. Nevertheless he does not neglect to keep a record of the precise day on which it took place.

66. Years pass away, and our astronomer has passed away with them—he and all his generation; but a regular re-

cord is now kept of celestial occurrences, and especially of eclipses. At length it comes to be perceived that there is a periodicity even in such untoward phenomena, and an attempt is ultimately made, by means of this knowledge, to predict when the next eclipse will take place. It is perfectly successful, and this event loses from thenceforth much of its portentous significance.

67. Centuries move on, and the apparent motions of the heavenly bodies have now been gradually reduced to system. The stars in particular are found to move, just as if they were attached to the roof of a great hollow vault which moves round the earth once in twenty-four hours. But even amongst them there are five exceptions—namely, Mercury, Venus, Mars, Jupiter, and Saturn—which perform a sort of wandering or zigzag motion in the midst of their stationary brethren, and have in consequence received the name of planets. All, however, are supposed to move round the earth, which forms the centre of the universe.

68. In process of time, this superiority of the earth over the heavenly bodies comes to be questioned. There is a rising tendency to regard our earth as a somewhat insignificant member of a great system, rather than as something apart by itself. These tendencies are, however, strongly opposed by the authorities of a large section of the Christian Church, on the ground that the language employed in the Jewish Scriptures is against such a method of regarding the universe. Nevertheless the Copernican system ultimately prevails, and the planets and the earth are associated together as stars which travel round the sun; while the diurnal motion of the heavenly bodies is attributed to a motion of the earth round its axis. And we cannot help thinking that philosophers of the present day are too

much disposed to undervalue the absolutely enormous stride that was made when the Copernican system was fully established.

69. But the planets are still supposed to move in perfect circles round the sun; for besides agreeing very well with observation, there is a simplicity in the circle that leads philosophers to believe that nature would adopt it in preference to any more complicated curve. Has it not been found that all apparent deviation from simplicity was in reality due to the fact that our point of view is a moveable one, and does not this lead us to believe that the real truth will be found in a circular orbit?

70. While such speculations are indulged in, Tycho Brahe is busy with his instruments. He is a thoroughly accurate man of science, and makes most excellent observations of the various planets. These are ultimately discussed by Kepler, who finds that the planets do not move round the sun in circles, but in ellipses, having the sun in one focus. He finds too that any one planet describes areas which are proportional to the times of description; while the squares of the periodic times of the various planets are proportional to the cubes of their mean distances from the sun. These are Kepler's laws; they are yet, however, only empirical. We know them to be true, but we cannot tell why they should be as they are and not otherwise.

71. It was reserved for the genius of Newton to show us why the planets should obey these laws, and to reduce the planetary system under the domain of ordinary mechanics. He succeeded in showing that every mass of matter attracts every other mass with a force which is directly proportional to the product of the masses, and inversely proportional to the square of the distance, and that this

universal force accounts not only for Kepler's laws of planetary motion, but for the orbit of the moon, as well as for that of a projectile discharged at the surface of the earth.

72. If we now pause for a moment, and review the progress of this problem, we shall see that it began with a disposition to regard simplicity of motion as a test of truth, and when the Copernican system showed that our point of view is a moveable one, it was at first thought that this would explain all departures from absolute simplicity. But Tycho Brahe and Kepler soon showed that the planets do not move in circles, and we now know that their motions, as well as that of the moon, can only be represented by curves of extreme complexity. Simplicity of motion has disappeared, but it has been replaced by simplicity of relation between the various members of the system which are supposed to attract each other according to a simple and definite law. This law may be supposed to contain in itself implicitly all the various and complicated motions of the solar system. If applied to the past it will enable us to ascertain the exact date of the ancient historical eclipses; if applied to the future it will enable us to foretell all the important astronomical occurrences.

While we are writing these words, expeditions are in progress to observe the transit of Venus, which, we know, will take place in December 1874; but by the time this book has been published that occurrence will doubtless be a thing of the past.

73. Turning now to another branch of the same problem, when Galileo first applied his telescope to the sun, he discovered the existence of sun spots. Their solar origin was however for some time disputed, the schoolmen of that day

being indisposed to believe that there could be any possible imperfection in the sun. There was even a sermon preached on Galileo, the text of which was "Viri Galilæi, quid statis in coelum spectantes?"

However, as time went on, observation showed that spots were unmistakably solar phenomena, and we now know that these very imperfections are made use of by modern science to obtain for us information regarding the chemical and physical structure of our luminary. It also appears that the position and size of these spots depend upon the positions of the planets Mercury and Venus, and this as well as other phenomena indicate the existence of some mysterious bond between the sun and the various members of his system, possibly other than the law of gravitation, as we now understand it, can express. In fine, simplicity of relation threatens to disappear, just as simplicity of motion disappeared before it.

74. Nevertheless in this triumphal march the progress has always been from the less to the more perfect, from the glimmering of early dawn to the clear morning light, if not to the bright beams of the noonday sun. Temporary obstacles have appeared only to be surmounted, and like Augustine's ladder to constitute a platform from which a higher and more comprehensive view might be obtained. Difficulties too, other than physical,—struggles, weariness, opposition have been encountered and overcome, nor has there been anything like a grave defeat, or the production of permanent confusion. The concluding words of the *Te Deum* have been abundantly fulfilled in the experience of the astronomer. He has trusted in God, and he has never been confounded.

75. Here then we have an instance of what is meant by

Continuity. It does not imply an easy progress, or a smooth level road ; it is consistent with a temporary halt, perhaps not even inconsistent with a temporary breakdown, or with momentary despair. We are met by difficulties of many kinds—the rock, the tangled growth, the swamp, the thick darkness, but never by the abyss. Nothing has occurred to convince us that our path has been absolutely wrong from the very commencement, and that we must altogether retrace our steps ; and the same thing holds in other problems besides astronomy. Once we have accumulated sufficient trustworthy evidence to show us that we are in the right way, we are never afterwards irretrievably defeated.

76. Our readers will now perhaps wish to have an example of a breach of Continuity,—this is easily given. Let us suppose for instance that the sun, moon, and stars were to move about in strange and fantastic orbits during a day, after which they returned to their previous places. Here we have an excellent example of a breach of Continuity, for even if things were so arranged as to prevent physical disaster, it is evident that the whole intelligent universe would be plunged into irretrievable mental confusion. Never again could it be said that astronomy is competent to explain the varied motions of the heavenly bodies. The observers of the universe would lay down their instruments, and the mathematicians their calculations, and the science would come to an end.

Other examples of a breach of Continuity may be as easily imagined. Suppose for instance that the gold of the world were to disappear for six hours and then return to it again, —should we not have all the social relations of men as well as their conceptions of matter thrown into irretrievable con-

fusion? This would not, however, be due to the mere fact that something has disappeared from the visible universe. Individual consciousness we have seen is seemingly in the habit of doing so and again reappearing, and we do not trouble ourselves much about it.

Continuity, in fine, does not preclude the occurrence of strange, abrupt, unforeseen events in the history of the universe, but only of such events as must finally and for ever put to confusion the intelligent beings who regard them.

77. It thus appears that, assuming the existence of a Supreme Governor of the universe, the principle of Continuity may be said to be the definite expression in words of a trust that He will not put us to permanent intellectual confusion, and we can easily conceive similar expressions of trust with reference to the other faculties of man.

78. Let us now endeavour to apply this principle to the discussion of those events that are alleged to have taken place in connection with the life of Christ. We may begin by assuming that had these events been ordinary ones no doubt would have been entertained regarding their actual occurrence; it is not, however, our province to discuss the historical evidence in favour of Christianity.

Now, until of late years, the divines who have asserted the actual occurrence of these events have attached to this assertion an hypothesis of their own, representing the events in question as absolute interferences of the Divine Governor with his usual physical procedure. Each was thus supposed to represent in its physical aspect something that could not possibly be deduced from that which went before or that followed after.

It was not exactly asserted that they were arbitrary

events, or that they were not the results of purpose, but only that the purpose of which they were the accomplishment could not be carried out without some physical break. In fine, for the object of removing spiritual confusion, intellectual confusion was introduced, as being the lesser evil of the two, so that each intelligent being will for ever continue baffled in any attempt to explain these phenomena, because they have no physical relation to anything that went before or that followed after; in fine, they form a universe within a universe, a portion cut off by an insurmountable barrier from the domain of scientific inquiry.

79. It is not sufficient to say that we cannot see any foundation for this hypothesis introduced by theologians regarding these events. It is desirable to add, as we have done already (Art. 36), that such a method of regarding them is essentially opposed to the genius of Christianity. Whatever may be thought of the person of Christ, it cannot for a moment be said that He was above law. He speaks of himself and is spoken of by the apostles as bound in all respects by the laws of the universe. Nor will it suffice to say that He obeyed the moral and spiritual, but broke occasionally the physical laws of the universe, or had them broken for Him. In fine, what Christ accomplished was not in defiance of law, but in fulfilment of it; and that He was able to do so much was simply due to the fact that His position with reference to the universe was different from that of any other man.

80. Of late years, however, a better method of explanation has been adopted. Charles Babbage, the designer of the well-known calculating engine, showed in a very remarkable book which he called a ninth Bridgewater treatise, that it would be possible to design and construct a

machine, which after having worked for a long time according to a particular method of procedure, should suddenly manifest a single breach in its method, and then resume and for ever afterwards keep to its original law. He argued from this that an apparent breach in the physical procedure of the universe is quite consistent with the fundamental idea of law. Jevons also, commenting upon these speculations of Babbage, remarks thus in his *Principles of Science* (vol. ii. p. 438), "If such occurrences can be designed and foreseen by a human artist, it is surely within the capacity of the Divine artist to provide for similar changes of law in the mechanism of the atom, or the construction of the heavens."

81. We think that this is a distinct advance upon the old idea, but nevertheless we venture to pronounce it incomplete without some further explanation.

The power of the Divine Being is surely unlimited, but, nevertheless, we have perfect trust that God will work in such a way as not to put us to permanent intellectual confusion. Yet even on this hypothesis, and with this trust, a single apparent exception to the usual procedure may be supposed to occur, if it be allowed that this may be made use of in order to deduce from it the great general law of working which includes both the usual course and the apparent exception. But it appears to us that if the exception be of such a nature that it must for ever confound all the intelligences of the universe who regard it, then we gain nothing by the supposition that it was allowed for in the secret counsels of God.

82. Undoubtedly we cannot permit certain events to be set aside by merely human authority as questions into which it is deemed unprofitable or useless for our reason to

pry; nay, we are tempted to advance even further than this, and to assert that it constitutes our duty as well as our privilege to do our best to grasp the meaning of all events that come before us. Do not all terrestrial occurrences of whatever nature form that material upon which the intellect of man is intended to work—that earth which man is commanded to subdue—a command equivalent to victory?

83. We have now indicated with sufficient clearness the fault we have to find with the theological position as it stood until recently,—let us next briefly allude to the extreme school of science. Ignoring all but the visible universe, and applying the principle of Continuity to its phenomena, they were indubitably led to most important generalisations regarding the method of working of this great system. They even drove back with much success, and very properly, certain detachments of theologians who had occupied portions of the field in an unwarrantable manner. So far the Genius which they had summoned up appeared to be the very principle of order. But things wore a different complexion as time went on. It was fancied that historical Christianity must disappear, and that the doctrine of immortality must follow after it. They were surrendered. But it was extremely startling when the Genius invoked, not content with what he had already devoured, insisted upon the ultimate sacrifice of the visible universe,—*then* the most extreme partisans of the school began at length to be alarmed. It was too much to be borne, that a Genius summoned up in the very name of order should turn out to be such an insatiate demon as this! Must the whole visible universe, indeed, arrive at such a state as to be totally unfit for the habitation of living beings? The individual they were content to sacrifice, per-

haps even the race, but they would spare the universe. Undoubtedly, if it be possible to pity men who could so easily dispense with Christianity and immortality, they had at length got themselves into a deplorable dilemma. For, indeed, the principle they had invoked was absolutely without pity, and in the most heartless manner continued to insist upon the sacrifice of the visible universe. This, they were told, was only a huge fire, and must ultimately burn itself out. Nothing would be left but the ashes,—the dead and worthless body of the present system.

84. No wonder, then, that these men should be startled at their conclusion, and try somehow to evade it. We sympathise with their perplexity; nay, we go further, and assert that to imagine the whole universe to come to an end is a monstrous supposition, carrying its refutation on its very face. Nevertheless, we do not hesitate likewise to assert, that the visible universe must, *certainly in transformable energy, and probably in matter*, come to an end. We cannot escape from this conclusion. But the principle of Continuity upon which all such arguments are based still demanding a continuance of the universe, we are forced to believe that there is something beyond that which is visible, or, to use the words of an old writer (which we have inscribed on our title-page),—"the things which are seen are temporal, but the things which are not seen are eternal."

85. Looking back instead of forward—to the origin of this visible universe, rather than to its end, we are brought to a similar conclusion. If the visible universe is all that exists, then the first abrupt manifestation of it is as truly a break of continuity as its final overthrow.

It may sound strange to some of our readers to be told that it is the duty of the man of science to push back the

Great First Cause in time as far as possible; nevertheless, this accurately represents the part in the universe which he is called upon to play. We dig into the crust of the earth and find therein stratified deposits containing fossil forms, and we may either suppose that God created these as they are, or that they came into their place through the operation of natural forces, and represent the relics of an ancient world of life; the latter of these is undoubtedly the scientific hypothesis. The only other hypothesis is that of some prominent luminaries of the Romish Church, who asserted that the devil put the fossils there.

Or, again, we may suppose that God created the sun, placed the earth and the other planets in their present position, and gave them the requisite velocity, all at once, or that the solar system gradually condensed into its present state from a chaotic mass of nebulous material; certainly, again, the latter is the scientific hypothesis. In like manner, if we can suppose any material phenomenon, any conditioned order of things, antecedent to the appearance of the visible universe, we have gained a step. In fact, we conceive it to be the duty of the man of science to treat the original production of the visible universe just in the same way as he would any other phenomenon. It is no doubt a very large thing, but we must not be terrified at mere bigness,—we must mete out the same scientific measure to all events, whether they be great or small. We therefore welcome an hypothesis like that of Sir W. Thomson, which regards the primordial atoms of the visible universe as vortices somehow produced in a pre-existing perfect fluid, provided that such an hypothesis is otherwise tenable.

86. Let not any of our readers regard this process as an attempt to drive the Creator out of the field altogether, for

this is not the case. Is it less reverent to regard the universe as an illimitable avenue that leads up to God, than to look upon it as a limited area bounded by an impenetrable wall, which, if we could only pierce it, would bring us at once into the presence of the Eternal?

In fine, we do not hesitate to assert that the visible universe cannot comprehend the whole works of God, because it had its beginning in time, and will also come to an end. Perhaps, indeed, it forms only an infinitesimal portion of that stupendous whole which is alone entitled to be called THE UNIVERSE.

87. We thus see that the extreme scientific, as well as the old theological school, have erred in their conclusions, because they have neither of them loyally followed the principle of Continuity. The theologians, regarding matter and its laws with contempt, have without scruple assumed that frequent invasions of these laws could constitute a tenable hypothesis. On the other hand, the extreme school of science, when they were brought by the principle of Continuity into such a position that the next logical step should have been the realisation of the unseen, failed to take it, and have suffered grievously in consequence.

88. It remains now, before concluding this chapter, to apply the principle of Continuity to the problem we have in hand.

There are three conceivable suppositions with reference to individual immortality. It may be regarded as a transference from one grade of being to another in the present visible universe; or secondly, as a transference from the visible universe to some other order of things intimately connected with it; or lastly, we may conceive it to repre-

sent a transference from the present visible universe to an order of things entirely unconnected with it.

89. This last hypothesis may however be very speedily disposed of if we are to maintain the principle of Continuity. We have seen that one of the requisites for existence is an organ connecting the individual with the past. Now, if we suppose a transference from the present visible universe to an order of things entirely unconnected with it, this will imply the creation in the future universe, in the case of each individual so transferred, of a set of organs having reference to something entirely different from the universe, in order that each such individual may have the sense of continued existence. But this would be a manifest breach of the law of Continuity. Imagine the utter confusion into which this present universe would be plunged, if a set of inhabitants were transferred into it having a past entirely unconnected with it. Now, a confusion precisely similar would be occasioned by carrying out a transfer according to the hypothesis in question; so that we are able at once to reduce our suppositions to two: the first implying a transference from one grade to another of the visible universe and the second a transference from the visible universe to some other order of things intimately connected with it.

90. In what precedes, we have argued by anticipation that the present visible universe will become effete; but in the following chapters it will be necessary to maintain this assertion by a minute examination of those laws which represent the course of things pursued in the present universe. In other words, we must settle the fitness or unfitness of the present visible universe before we proceed to discuss our second hypothesis.

91. But whether the transfer be supposed to take place

in the visible universe, or from it to another intimately connected with it, the subject in either case is one on which we may legitimately employ our reasoning faculties. So far indeed is its subject from being one which it will be utterly and for ever useless to discuss, that it becomes our duty as well as our privilege to make the attempt, in the perfect trust that time will inevitably bring truth with it. We think that this has been too much overlooked by those whom we may term the moderate school of scientific thinkers. Not denying immortality, they have yet shrunk from all attempts to investigate its conditions. We are in hopes that a perusal of this volume will lead these writers to see that the subject is one which may be profitably discussed.

CHAPTER III.

THE PRESENT PHYSICAL UNIVERSE.

"The cloud-capp'd towers, the gorgeous palaces,
The solemn temples, the great globe itself,
Yea, all which it inherit, shall dissolve;
And, like this insubstantial pageant, faded,
Leave not a rack behind."—SHAKESPEARE, *Tempest.*

"All worldly shapes shall melt in gloom,
The sun himself must die
Before this mortal shall assume
His immortality."—CAMPBELL.

92. HAVING in the last chapter briefly indicated the nature of the proposition which we intend to bring forward, we must next study, as a preliminary to further discussion, what science tells us about the present physical universe: what are the general laws to which it is now subject; when and what must have been its beginning; when and what will be its inevitable end.

We have been driven into becoming accustomed to the phrase, "the material universe," which is generally used in a sense absolutely identical with that which we have chosen as our title. We shall soon see that the term is a very inapt one, inasmuch as matter is (though it may sound paradoxical to say so) the less important half of the material of the physical universe.

In the present chapter we shall still further restrict ourselves by omitting, as far as possible, any reference to life

(even in its lowest aspect), and we likewise defer to a future chapter our account of the more reasonable speculations which have been advanced with regard to the intimate structure of matter and ether.

93. It is only within the last thirty or forty years that there has gradually dawned upon the minds of scientific men the conviction that there is something besides matter or stuff in the physical universe, which has at least as much claim as matter to recognition as an objective reality, though, of course, far less directly obvious to our senses as such, and therefore much later in being detected. So long as men spoke of light, heat, electricity, etc., as imponderables, they merely avoided or put aside the difficulty.

When they attempted to rank them as matter,—heat, for instance, as caloric,—they at once fell into errors, from which a closer scrutiny of experimental results would assuredly have saved them. The idea of *substance* or *stuff* as necessary to objective existence very naturally arises from ordinary observations on matter; and as there could be little doubt of the physical reality of heat, light, etc., these were in early times at once set down as matter. Fire, in fact (including, it is to be presumed, everything which involved either heat or flame, real or apparent), was in early times one of the four so-called *elements*.

In those days the sun was supposed to be only a great fire; a lightning-flash, an aurora, or a comet, was merely a flame; in other words, the essence of all these was the element fire, or, as it was later called, caloric. The sun, except when he appeared as the spreader of pestilence, was the beneficent fire, as were also some of the planets; the lightning, the comet, even the moon and Saturn, were baleful fires.

This endeavour to assign a substantive existence to every phenomenon is, of course, perfectly natural; but on that very account excessively likely to be wrong.

Humanum est errare comes with quite as much heart-felt conviction of its truth from the lips of the honest Pagan as from those of the Christian believer; though perhaps its meaning may be considerably less extended in the former than in the latter case.

94. But, before discussing what is that *something else* besides stuff which has an *objective* though not a *substantive* existence, let us in the first place inquire into the grounds of our belief, that matter itself has a real existence external to us; that, in fact, the so-called evidence of our senses is not a mere delusion. (Now, some extreme thinkers write as if they would persuade us that a species of hallucination affects with similar impressions every individual mind, so that, for instance, one man may usefully warn another about a pitfall on a dark road, and so save him from a catastrophe which might otherwise be caused by something which exists, if at all, in the mentor's mind only,—at all events not as yet in that of his pupil; though, if the warning be unheeded, or not given, there will presently be another mind in which the pitfall will certainly exist with startling vividness. But this is altogether repugnant to every conviction which experience (our only guide in such matters) enables us to form; and, in the shape in which we have put it, could hardly be held at all by any reasonable being. Now physical science furnishes us with the following among many other arguments in proof of the reality of the external universe:—*Experience of the most varied kind consistently shows us that we cannot produce or destroy the smallest quantity of matter.* Exer-

cise our greatest powers of imagination, do with it what we please, we cannot make our senses indicate to us an increase or diminution in a given quantity of what we call matter. We find it so far amenable to our control that we can alter its arrangement, form, density, state of aggregation, temperature, etc.; nay, by so approximating it to other matter as to produce a chemical combination, we may entirely transform its appearance and properties,—*all but one:* its mass or quantity is completely beyond our control. Measure it by what process we please, by the "muscular sense," by weight, anyhow, there it is, altogether independent of us, laughing our efforts to scorn! Can this be a mere mental idea which the mind that conceived it (or, at all events, in some way received the conception of it) is unable to destroy?

But there is one other argument on this point which must be mentioned. Not only do our own senses invariably indicate to us the impossibility of altering the quantity of matter, but the senses of all men alike point to the same quantity, quality, and collocation of matter in the earth and external to the earth. Whence this extraordinary agreement between the evidences of the senses in different men, when the minds are so different?

Our conviction then of the objective reality of matter is based upon the experimental truth that we can neither increase nor diminish its quantity, in fact on what we may conveniently for our present purpose call the *Conservation of Matter.*

95. Here let us pause for a moment to compare together this view of matter and the definition of the laws of the universe, which we have already given. The laws of the universe we defined (Art. 54) to be the laws according to

which the beings in the universe are trammelled by the Governor thereof as regards time, space, and sensation. Now, it may be asked, is this definition consistent with a belief in the objective reality of matter? We reply, that the two are in perfect accordance.

We do not here intend to enter into any metaphysical discussion. It is enough for us to say that our practical working certainty of the reality of matter means, *firstly*, that it offers resistance to our imagination and our will, and, *secondly*, that in particular it offers *absolute* resistance to all attempts to change its quantity. We shall soon see that both properties belong to something else.

96. Returning from this digression let us therefore assume that the objective reality of the external universe has been proved, and that this reality is strongly impressed upon us in virtue of that principle which we have called the conservation of matter.

But as soon as we grant this, we are obliged by our reason, however little our senses may incline us to it, or rather however much they may dispose us against it, to allow objective reality to whatever is found to be *in the same sense* conserved. (We have here italicised these four words for a reason which will afterwards appear.) This is a question which deserves and must get careful consideration.

97. In abstract dynamics several things are said and mathematically proved by deductions from experiment to be conserved, but one only of these in the strict sense in which we have spoken of the conservation of matter. We will examine them briefly, and our non-mathematical readers must pardon us if in this examination we make use of certain technical expressions belonging to the domain of mathematical physics.

(1.) *Conservation of Momentum.*—What is understood by this is a mere direct consequence of Newton's *first* interpretation of his third law of motion, viz., that *Action and Reaction are equal and opposite.* Stated in its simplest form it asserts that the momentum of a system of bodies, measured in any direction whatever, is not altered by their mutual action, whether that action be of the nature of traction, attraction, repulsion, or impact. And we see at once from this third law of motion that it must be so, because the change of momentum, in any direction, of any one part of the system, per unit of time, is the measure of the force acting on that part in that direction. Whatever momentum in this particular direction is gained by one member of the system must have been lost by other members, but not from their whole momentum, merely from the part of it in this direction. It thus appears that the (algebraic) sum of the momenta generated by the mutual actions of the system is zero.

These momenta are in fact *directed magnitudes* (like the forces of which they are the measure), and are therefore capable of *cancelling one another.* In this sense the conservation is of the same nature as that of the imagined electric or magnetic fluids, where no portion whatever of one kind can be produced without the simultaneous appearance of an equal quantity of the other, a quantity just capable of neutralizing it. This is obviously not in any sense analogous to the Conservation of Matter of which we have just spoken.

(2.) *Conservation of Moment of Momentum.*—Here we deal with quantities of the order of the moments of forces about an axis, *i.e. couples* in Poinsot's sense. These also are directed magnitudes depending for their conservation

upon the first interpretation of Newton's third law, and therefore the same remarks apply to them as to the preceding.

(3.) *Conservation of Vis Viva.*—*Vis viva* is the old name for energy or the power of doing work. We now deal with quantities which cannot possess direction, because they are essentially *products of pairs of quantities similarly directed,* and are therefore all to be treated as of the same algebraic sign, or rather (to adopt the language of Sir W. R. Hamilton) as signless quantities. With such there can of course be no cancelling.

To make our meaning clear, let us consider upon what *vis viva* depends. It depends upon and is proportional to the product of the mass into the square of the velocity. Now mass is of course a signless quantity; evidently we cannot have negative mass. Then with regard to the square of the velocity, this will be positive whether the velocity be positive or negative, whether it be in one direction or the opposite. *Vis viva,* therefore, or energy, is something which is not affected with the sign of direction, or, as we have already said, it is a signless quantity.

98. We have said that the energy which a body contains—its *vis viva*—its power of doing work, is independent of the direction in which it is moving; and, further, that while the mass is the same, it is proportional to the square of the velocity. For instance, we may measure the energy of a cannon ball or of an arrow by the distance it will carry itself up against the force of gravity, represented by its own weight, when shot vertically upwards, and we find that with a double velocity it will go four times as high. Or we may point the cannon horizontally, and measure the energy of the same ball by the number of planks of oak wood which it can penetrate, and

we shall find that a ball with double the velocity will penetrate nearly four times as many as one with the single velocity. All these experiments concur together in convincing us that the energy of the ball is independent of the direction in which the cannon is pointed, and is proportional to the square of the velocity, so that a double velocity will give a fourfold energy.

99. We have just now spoken about a cannon ball fired into the air against the force of gravity. Such a ball, as it mounts, will each moment lose part of its velocity, until it finally comes to a standstill, after which it will begin to descend. When it is just turning it is perfectly harmless, and if we were standing on the top of a cliff to which it had just reached, we might without danger catch it in our arms and lodge it on the cliff. Its energy has apparently disappeared. Let us, however, see whether this is really true or not. It was fired up at us, let us say, by a foe at the bottom of the cliff, and the thought occurs to us to drop it down upon him again, which we do with great success, for he is smashed to pieces by the ball.

In truth, dynamics informs us that such a ball will again strike the ground with a velocity, and therefore with an energy precisely equal to that with which it was originally projected upwards. Now, when at the top of the cliff, if it had not the energy due to actual motion, it had nevertheless some sort of energy due to its elevated position, for it had obviously the power of doing work. *We thus recognise two forms of energy which change into one another, the one due to actual motion and the other to position; the former of these is generally called kinetic, and the latter potential energy.* All this appears to have been clearly perceived by Newton, who gave it as a *second* interpreta-

tion of his Third Law of Motion. His statement is in language equivalent to the following:[1]—*Work done on any system of bodies has its equivalent in the form of work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent.*

100. Thus Newton expressly tells us (though not in these words) that we are to include in the same category work done by or against a force—whether that force be due to gravity, friction, or molecular action (such as elasticity, for instance), or even to acceleration.

(*a.*) When work is done against gravity, as in lifting a mass from the ground, we have just seen that it is (as it were) stored up in the raised mass; we can recover it at any time by letting the mass descend. Thus it is that we furnish a clock with motive power sufficient to keep it going for a week in spite of friction and other resistance, by simply winding up its weights.

(*b.*) When work is done against molecular forces, we have a similar storing up, as, for instance, in drawing a bow or in winding up a watch.

(*c.*) When work is done against the inertia of a body, *i.e.* to accelerate its velocity, Newton's definitions show that the kinetic energy so produced is equal to the work so spent.

(*d.*) In abstract dynamics we simply consider as lost the work spent against friction. In Newton's time it was not known what became of it.

101. Leaving out then, for the present, the fourth alterna-

[1] See Thomson and Tait's *Natural Philosophy*, § 269; or Tait's *Thermodynamics*, § 91.

tive, we see that whatever work is spent we must, according to Newton, even in abstract dynamics recognise that *it is not lost, but only transformed* into an equivalent quantity stored up for future use, either in a quiescent form (as, for instance, a raised weight or bent spring), or in an active form (as *vis viva* of a moving mass). Here, then, at last, we recognise the same sort of conservation as that which we found in matter. But the statement so far is defective, as we have seen, in one particular. What becomes of work spent in overcoming friction? or what becomes of the energy of the blacksmith's hammer after it has struck the anvil? To this experiment alone can give the answer. Let us see what it has told us.

Man has been called a reasoning animal, a laughing animal, according to the momentary whim or humour of the classifier; but he is perhaps still more definitely separated from all other animals when specified as the "cooking animal." Now, it has always appeared to us as something little short of marvellous, that even for the high purpose of cooking his food, or of inflicting exquisite torture on a vanquished foe, savage man should ever have hit upon the process of procuring fire by friction. Considering his condition, and comparing his opportunities and his success with those of even our greatest modern physicists, we cannot but look upon this as one of the very greatest and most notable discoveries ever made in physics. All the more notable, too, from the fact that a man like Newton, though of course aware of it, absolutely missed its significance even at the very moment when it alone was wanted to fill a serious *lacuna* in one of his grandest and most important practical generalisations. The missing link was all but supplied by Rumford and Davy at

the very end of last century. Rumford's boiling of water by the heat generated in the boring of a cannon, and Davy's melting of ice by friction *in vacuo*, were each conclusively demonstrative alike of the non-materiality of heat and of the ultimate fate of work spent in friction, which is thus seen to be converted into heat; or at least these experiments could easily have been made demonstrative by very slight additions to, or modifications of, their authors' methods or reasoning. But the exact and formal enunciation of the equivalence of heat and work required to fill the *lacuna* in Newton's statement was first given by Davy in 1812.

102. Let us here pause for a moment and contemplate the position to which the problem had now attained. Visible kinetic energy, such as that of a cannon-ball shot upwards, is transformed as it rises into visible potential energy. As the ball descends its energy is retransformed from the potential into the kinetic variety until, when it is about to strike the earth, it has, or rather would have if there were no atmosphere, as much kinetic energy as it had when it was first shot upwards.

When the ball has once struck the earth its kinetic energy is changed into heat, and we have very many reasons for regarding heat as only another species of energy: and, generally speaking, in all cases of friction, percussion, and atmospheric resistance we have a change of visible energy into heat, as for instance when a railway train is stopped by the action of the break, when a blacksmith strikes the anvil with his hammer, or when a cannon-ball moves through and heats the air.

We had thus come to the stage of regarding heat as a species of molecular energy into which visible energy is very often transformed, and very soon after it came to be

perceived that there were other forms of molecular energy besides heat—some of these being potential and some kinetic. Thus we may have two substances possessing chemical affinity separated from each other just as we may have a stone separated from the earth, and we obtain a form of potential energy in the one case as truly as in the other. When, for instance, we have carbon or coal in our cellars or our mines, and oxygen in the air, we are in possession of a store of energy upon which we can draw at any moment and change it during the process of combustion from the potential to the kinetic form. Again, in a current of electricity we have no doubt a species of kinetic energy, although it would puzzle men of science to say what such a current precisely means. From all this, without entering further into scientific details, our readers will perceive that there are a variety of forms, some of them potential and others of them kinetic, in which energy may appear.

While we were thus grasping the fact that energy can appear under various forms we were also beginning to perceive that it had great powers of transmutation—going about from one form to another, and Sir W. R. Grove did good work at this stage of the inquiry in bringing together the various cases of such transmutations in his work on the Correlation of the Physical Forces.

In spite of this, it was left for Joule and Colding, who worked almost simultaneously and by well-devised experimental methods from about the year 1840, independently to discover, and by degrees to enunciate, by means of arguments founded on the only admissible basis of experiment, the grand law of the conservation of energy. In its most general form, the statement of the conservation of energy is merely a completed version of the passage we have

already quoted from Newton; and the experimental discoveries of Rumford and Davy, extended and completed by Joule and Colding, allow us to put Newton's second or alternative interpretation of his *third law of motion* into the modern statement of the *conservation of energy.*

In any system of bodies whatever, to which no energy is communicated by external bodies, and which parts with no energy to external bodies, the sum of the various potential and kinetic energies remains for ever unaltered.

In other words, while the one form of energy becomes changed into the other,—potential into kinetic and kinetic into potential,—yet each change represents at once a creation of the one kind of energy and a simultaneous and equal annihilation of the other, the sum of both, as we have already said, remaining meanwhile unaltered.

103. Taking as our system the whole physical universe, we now see that, according to the test we have already laid down, energy has as much claim to be regarded as an objective reality as matter itself. But the forms of statement are most markedly different for the two. We before spoke of the quantity of matter without qualification, but we now speak of *the sum of the two kinds* of energy. Let us think for a moment of this, and we see that whereas (to our present knowledge, at least) matter is always the same, though it may be masked in various combinations, energy is constantly changing the form in which it presents itself. The one is like the eternal, unchangeable Fate or *Necessitas* of the ancients; the other is Proteus himself in the variety and rapidity of its transformations.

104. And again, *energy is of use to us solely because it is constantly being transformed.* When the sluice is shut, or the fire put out, the machinery stops; when a man cannot

digest his food, he breaks down altogether. Coal in itself, except on account of an occasional fossil it may contain, or its still somewhat uncertain mode of formation, or (to take a lower point of view) as a material for ornament, is a very useless thing indeed : its grand value consists in its chemical affinity, in virtue of which it possesses great potential energy as regards the oxygen of the air, which can very easily be transformed into its equivalent in heat. "Keep your powder dry" is merely one way of saying "preserve the ready transformability of your energy." In fact, if we think for a moment over what has just been said, to the effect that the only real things in the physical universe are matter and energy, and that of these matter is simply passive, it is obvious that all the physical changes which take place, including those which are inseparably associated with the thoughts as well as the actions of living beings, are merely transformations of energy. Thus it is an inquiry of the very utmost importance as regards the present universe : *Are all forms of energy equally susceptible of transformation?* To see the importance of this question, the reader has only to reflect that if there be any one form of energy less readily or less completely transformable than the others, and if transformations constantly go on, more and more of the whole energy of the universe will inevitably sink into this lower grade as time advances. Hence the whole possibility of transformation must steadily grow less and less ; in scientific language, though the *quantity* of energy remains for ever unchanged, its *availability* steadily decreases.

105. Now, every one knows a case in which there may be an unlimited amount of energy present, no part of which is available for transformation. It is the simple one of heat in a number of bodies, *when all are at the same*

temperature. To obtain work from heat we must have hotter and colder bodies, to correspond, as it were, with the boiler and condenser of a heat engine; and just as we get no work from still water if it be all at the same level, *i.e.* if no part of it can fall, so in like manner we can get no work from heat unless part of it can fall from a higher to a lower temperature.

106. The first step in the investigation of the transformation of heat into work was taken by Sadi Carnot in 1824: a step of inestimable value in every branch of modern physical science. He devised a method of startling originality for the purpose of attacking this special question of the production of work from heat. His inferences from its application were not all correct; this was due however to no fault of the method, but to the fact that he unfortunately assumed (though with caution, and under a protest almost amounting to an assertion of the opposite) the materiality of heat. His method embraces two perfectly new ideas:—

(1.) That, at least with our present knowledge, no inference is possible as to the relation between heat and work, until the heated or working substance is brought back, after a complete *Cycle* of operations, to its initial physical state.

Obvious as this statement, once made, is, it was altogether ignored (twenty years after Carnot) by Séguin and Mayer, whom some authors still persist in setting forth as the founders of the dynamical theory of heat. Their speculations were entirely vitiated by their violation of this principle.

(2.) That an engine whose cycle of operations is reversible is a perfect engine, that is to say, gives the greatest possible amount of work from a given quantity of heat with any assigned temperatures of boiler and condenser.

The term reversible is not here used in the popular sense in which a mere reversal of the direction of motion of each part is contemplated, *i.e.* what would be more properly termed "backing," it is used in the higher sense of taking an engine which converts a certain quantity of the heat spent on it into work, while it lets the rest down from the boiler to the condenser, and then changing or converting it into an engine upon which the same amount of work is spent with the result of taking back the heat from the condenser, adding to it the heat-equivalent of the work so spent, and thus restoring the whole of its original loss in heat to the boiler; simply in fact reversing all the results of the direct action.

107. Sir W. Thomson, in 1848, was the first to recall attention to the work of Carnot, after Colding and Joule had published their discoveries; and he pointed out that the action of the reversible engine gave what had been up to that time vainly sought, an absolute definition of temperature—a definition, that is, altogether independent of the properties of any particular species of matter. In fact it is obvious that as reversibility in the sense we have just explained is the stamp of perfection in a heat engine, all reversible engines, whatever be the working substance, will, under the same circumstances, that is to say, *with the same temperatures of boiler and condenser,* convert the same fraction of the heat spent on them into work. This, of course, still leaves wide scope for a definition of temperature, but that finally determined on by Thomson was chosen (in consequence of a hint from some experimental results of Joule) so as to make the absolute measurement agree nearly with that of the long-known air-thermometer. It therefore stands as follows :—

The heat taken in by a perfect engine is to the heat given out by it in the same proportion as the absolute temperature of the boiler to that of the condenser.

Of course it is hardly necessary to state that it is only the difference between the heat taken in and that given out by any engine that can have been converted into available work. This follows from the conservation of energy.

108. Experiments[1] carried on by Joule and Thomson together have shown that the absolute zero of temperature is nearly 274° below zero of the centigrade scale; so that on the absolute scale the temperature of melting ice is 274° while that of water boiling under the standard pressure is 374°.

In 1849 James Thomson made a very remarkable application of Carnot's reasoning, the first of a series of such applications which have since done immense service in the extension of almost every branch of physics. He showed in fact that, because water expands in the act of freezing, *the melting point of ice must be lowered by pressure.* Sir W. Thomson in the same year verified this deduction, to its numerical details, by direct experiment. Trifling as the predicted and measured effect appears (one degree centigrade for each 2000 lbs. additional pressure per square inch), there can now be no doubt that it goes at least very far to explain the varied effects of the extraordinary plasticity of glacier-ice so beautifully made out by the direct measurements of Forbes.

109. We have said that Carnot unfortunately based his reasoning on the assumed materiality (and therefore inde-

[1] They showed that in a perfect steam-engine with pressure equal to "one atmosphere" in its boiler, and with its condenser at the temperature of melting ice, the ratio of the heat taken in to the heat given out is 1·365 to 1. Hence if the difference between the numbers is to be 100, these must be 374, 274.—*Phil. Trans.*, 1854.

structibility) of heat. It therefore became a question of great importance to find how properly to adapt his methods to the true theory. James Thomson's verified prediction had already given a correct and absolutely new physical result from his principles. How then must we get rid of his false assumption?

Clausius attempted this in 1850, but his method is based solely upon the observed fact that in general heat tends from hotter to colder bodies. This we know is not always the case, for a fine wire may be made red-hot by the current from a thermo-electric battery (of a sufficient number of pairs) where ice and boiling water alone are used to heat and cool the alternate junctions. Here heat certainly passes from colder bodies to a hotter one. Clausius has, no doubt, since extended his original statement, so as to make it stand thus:—Heat cannot *of itself* pass from a colder to a hotter body. We do not consider even this sufficiently obvious for an axiom, were it certainly true, but, as will be seen later, it is not. In fact it is constantly being violated, though on a very small scale, in every mass of gas.

110. It was Sir W. Thomson[1] who (in 1851) first correctly adapted Carnot's magnificently original methods to the true theory of heat; and it is especially noteworthy to remark how, even at that early time, he saw the full danger of attempting to lay down anything too definite on the subject. The following is the axiom he gives:—

"*It is impossible by means of inanimate material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects.*"

[1] See Tait, *Phil. Mag.*, 1872, I. 338, 516; II. 240.

But he appends the following guarded note :—

"If this axiom be denied for all temperatures, it would have to be admitted that a self-acting machine might be set to work and produce mechanical effect by cooling the sea or earth, with no limit but the total loss of heat from the earth and sea, or, in reality, from the whole material world."

The full importance of this will appear presently.

To those who can accept Thomson's axiom with the explanation appended to it, Carnot's proposition that a reversible engine is perfect (in the sense of being the best possible) is demonstrated at once, as follows, *ex absurdo.*

Suppose there could be an engine, M, more perfect than a reversible engine, N. Set the two to work together as a compound engine, M letting down heat from boiler to condenser, and doing work ; N spending work in pumping back again the heat to the boiler. If N be made to restore to the boiler at every stroke exactly what M takes from it, the compound engine will do external work, for, by hypothesis, M is more perfect than N. Whence does the work come ? Not from the boiler, for it remains as it was. Hence N must take more heat from the condenser than M gives it ; *i.e.* you get work by cooling the condenser.

Carry the reasoning a little further, and we see that if the excess of work given by M were spent upon N, and thus no work on the whole either spent or given out, the condenser would be still further cooled, and the boiler heated! This, to most people, would seem to imply an ample *reductio ad absurdum.* But Clerk-Maxwell has shown it to be physically possible, and has thus fully justified Thomson's caution about his axiom. As this is a point of very great importance, we offer no excuse for treating it pretty fully.

111. Maxwell's reasoning is given as depending upon

the molecular theory of gases, but the only necessity for so restricting it appears to be that we thereby connect the reasoning more directly with *Heat*, which, on this theory, is supposed to be the energy of motion of the molecules of the gas. The illustration, however, is more general, and at the same time more simple, if we do not at first refer either to heat or to the molecular hypothesis of the constitution of gases, but treat the question simply as one concerning the possible motions of a number of little material particles.

Assume, then, that a great number of small equal spherical particles of matter are enclosed in a vessel of any form, and assume further that (either by collision or by repulsive force) each of these has the power of rebounding from another or from the wall of the vessel, as if it were elastic, and had unit *co-efficient of restitution*,[1] as defined in treatises on natural philosophy. Then it can be shown, as a matter of direct calculation, that—start these particles as we please, in all sorts of directions, and with velocities as varied as we please—after a time, which will be shorter as the number of particles is greater, a sort of permanent state will be arrived at in which a certain law of distribution of velocity prevails among the particles (the same law as that of the *Probability of Error*, as it is technically called), the greater number of them having nearly the mean square velocity, and those which have much less or more than that being fewer and fewer as the defect or excess is greater. The tendency is to an average distribution of these varieties of velocity throughout the vessel, and the impacts on the sides will thus be nearly the same on every square inch of its surface. After this there is—*always provided the particles be sufficiently*

[1] Thomson and Tait's *Natural Philosophy*, § 300; or Tait and Steele's *Dynamics of a Particle*, 3d ed. § 299.

numerous—no perceptible change in the statistics of the group, except in so far as concerns *individual* particles, which may sometimes be moving with great, sometimes with very small, velocity, but which, in the long-run, will far more often be moving with the mean square velocity, or at least some velocity very near it. Hence, in no part of the vessel will the average energy be sensibly greater than in another, and therefore (so far as the contents of the vessel alone are concerned) there is no possibility of getting work from them. But by enlisting in our service conceivable finite beings (imagined by Clerk-Maxwell, and called demons by Thomson), it would be possible materially to alter this state of things, even although these beings should do absolutely no work.

112. For suppose a firm partition, full of little doors (themselves without mass) to be placed so as to divide the vessel into two, and set a demon at each door, with instructions to open it for an instant whenever he sees he can thereby let a quick moving particle escape from the first compartment to the second, or a slow-moving particle from the second into the first. Then, *because the tendency is not to a uniform distribution of velocity* among the particles, but to a distribution which involves quicker and slower in certain proportions, we may imagine this process to be carried on long enough to make a considerable difference in the average velocities of the particles in the two compartments, *i.e.* a greater pressure per square inch on the walls of the second compartment than of the first; and thus, if the partition wall were moveable, a certain amount of work might be obtained by allowing it to move. Thus a group of particles originally incapable, without external assistance, of doing work, may be rendered capable of doing work by mere *guidance* applied by finite intelligence.

113. Now let us refer for a moment to the molecular theory of gases, and we see that what the demons (without any expenditure of work, each being, so far as he is required, virtually a combination of two intelligent perfect engines, one working direct, the other reversed) have guided the gas to do, is to transfer heat from a colder to a hotter portion of the gas.

The only reason why this does not occur without the assistance of demons (at least to an extent, or for a length of time, sufficient to produce a sensible effect) lies in the enormous number of particles per cubic inch in even the most rarefied gas. Hence, *solely because of the excessive numbers and minuteness of the particles of matter*, the one chance of escape from Carnot's proposition is denied us, and therefore we must allow that, so far as the physical universe is concerned, a reversible heat engine is the best possible.

114. But if a reversible heat engine be the best possible, then the principle which we have italicised in Art. 107 must hold good, and from this it follows that only a portion of the heat passing through a perfect engine can be transformed into useful work unless the condenser of the engine be at the absolute zero of temperature—a condition which can never be attained.

It thus appears that at each transformation of heat-energy into work a large portion is degraded, while only a small portion is transformed into work. So that while it is very easy to change all of our mechanical or useful energy into heat, it is only possible to transform a portion of this heat-energy back again into work. After each change too the heat becomes more and more dissipated or degraded, and less and less available for any future transformation.

In other words, the tendency of heat is towards equalisa-

tion; heat is *par excellence* the communist of our universe, and it will no doubt ultimately bring the system to an end. This universe may in truth be compared to a vast heat engine, and this is the reason why we have brought such engines so prominently before our readers. The sun is the furnace or source of high-temperature heat of our system, just as the stars are for other systems, and the energy which is essential to our existence is derived from the heat which the sun radiates, and represents only a very small portion of that heat. But while the sun thus supplies us with energy he is himself getting colder, and must ultimately, by means of radiation into space, part with the life-sustaining power which he at present possesses. Besides the cooling of the sun we must also suppose that owing to something analogous to ethereal friction[1] the earth and the other planets of our system will be drawn spirally nearer and nearer to the sun, and will at length be engulfed in his mass. In each such case there will be, as the result of the collision, the conversion of visible energy into heat, and a partial and temporary restoration of the power of the sun. At length, however, this process will have come to an end, and he will be extinguished until, after long but not immeasurable ages, by means of the same ethereal friction his black mass is brought into contact with that of his nearest neighbour.

115. Not much further need we dilate on this. It is absolutely certain that life, so far as it is physical, depends essentially upon transformations of energy; it is also absolutely certain that age after age the possibility of such transformations is becoming less and less; and, so far as we

[1] Stewart and Tait *on the Heating of a Disk by Rotation* in vacuo (*Proceedings of the Royal Society*).

yet know, the final state of the present universe must be an aggregation (into one mass) of all the matter it contains, *i.e.* the potential energy gone, and a practically useless state of kinetic energy, *i.e.* uniform temperature throughout that mass.

But the present potential energy of the solar system is so enormous, approaching in fact possibly to what in our helplessness we call infinite, that it may supply for absolutely incalculable future ages what is required for the physical existence of life. Again, the fall together, from the distance of Sirius, let us say, of the sun and an equal star would at once supply the sun with at least thirty times as much energy for future radiation to possible planets as could possibly have been acquired by his own materials in falling together from practically infinite diffusion as a cloud of stones or dust, or a nebula; so that it is certain that, if the present physical laws remain long enough in operation, there will be (at immense intervals of time) mighty catastrophes due to the crashing together of defunct suns—the smashing of the greater part of each into nebulous dust surrounding the remainder, which will form an intensely heated nucleus—then, possibly, the formation of a new and larger set of planets with a proportionately larger and hotter sun, a solar system on a far grander scale than the present. And so on, growing in grandeur but diminishing in number till the exhaustion of energy is complete, and after that eternal rest, so far at least as visible motion is concerned.

116. The study of the necessary future has prepared us for an inquiry into the long remote past. Just as the present discrete stellar systems must finally come together, so the materials which now form them must have originally been widely separate. Our modern knowledge enables us to

look back with almost certitude to the time when there was nothing but gravitating matter and its potential energy throughout the expanse of space—ready, as slight local differences of distribution predisposed it, to break up into portions, each converging to one or more nuclei of its own, and thus forming in time separate solar or stellar systems. We have thus reached the beginning as well as the end of the present visible universe, and have come to the conclusion that it began in time and will in time come to an end. Immortality is therefore impossible in such a universe.

CHAPTER IV.

MATTER AND ETHER.

"Felix qui potuit rerum cognoscere causas,
atque metus omnis et inexorabile fatum
subjecit pedibus, strepitumque Acherontis avari."

VERGIL.

"Who shall tempt with wandering feet
The dark, unbottomed, infinite abyss,
And through the palpable obscure find out
His uncouth way; or spread his airy flight
Over the vast abrupt, ere he arrive
The happy isle?"—MILTON, *Paradise Lost.*

117. THE next portion of the preliminary inquiry necessary to our concluding argument is that which relates to the intimate nature of matter; and more especially of that very wonderful form of matter which is the vehicle of all the energy we receive from the sun, as it is that of all the information we obtain about the position, motion, nature, mass, condition, and properties of the almost infinitely more distant bodies, which are scattered through cosmical space.

To use the comparison of a writer on energy, we have hitherto spoken only of the laws of working of that machine called the physical universe; let us now endeavour to study the structure of that material of which it is composed.

118. Various hypotheses have been proposed as to the ultimate nature of matter. To give even a general account

of all the less absurd of these would require a large volume, so we content ourselves with a few of the more reasonable or historically more important.

(1.) The foremost place must of course be taken by the old Greek notion of the *Atom*. The outlines of the atomic theory were laid down very precisely by Democritus and Leukippus (*circa* 400 B.C.), who taught that the whole universe is made up of empty space and eternal atoms, differing only in form (as A and N), order (as AN and NA), and posture (as Z and N). The atoms are endued with a primitive motion in virtue of their weight, and clashing together, produce vortices from which the world is formed. The gradual progress of this whirl of atoms brings similar elements together, as in the sifting of grain, and so the atoms are grouped into homogeneous masses. The great weakness of this theory lay in the very false ideas then held as to the nature of motion by weight, which was supposed to be necessarily in parallel lines, and with a velocity greater for heavy than for light bodies. The difficulty which arose from this notion led Epicurus to give to the atoms a perfectly arbitrary and capricious side movement, as well as the rectilineal motion due to their weight, and thus, in his school, the theory became really a metaphysical one, reducing the order of the universe to pure chance. It is such a medley of physical speculations, with metaphysical notions, that we find in the greatest exponent of the system, the "poet philosopher" Lucretius. With the help of Munro's splendid edition of the text of Lucretius, and his very valuable translation and notes, it is now a comparatively easy matter to give a concise summary of the principal points of this most remarkable early physical speculation. In attempting to do so we will endeavour, so

far as we can, to bear in mind the awful but too often disregarded warning given by the poet himself:—

> "Omnia enim stolidi magis admirantur amantque,
> inversis quæ sub verbis latitantia cernunt,
> veraque constituunt quæ belle tangere possunt
> auris et lepido quæ sunt fucata sonore."[1]

119. As the purpose of the poem of Lucretius is the establishment of the very opposite of our present theme, we must consider a good deal more of his work than the mere properties of atoms. Lucretius tells us that his object is to dispel the fear of the gods, which he supposes to arise simply from the fact that there are so many things which men do not yet understand, and therefore suppose to be effected by divine power.

Religion, which crushes human life prostrate upon earth, is, he says, now put under foot; and the great victory achieved by his Greek instructor over the immeasurable universe (in finding what can and what cannot come into being) brings us level with heaven.

His followers are not to fancy that there is any sin in this; on the contrary, religion has perpetually been the cause of sinful deeds. There is, however, danger of their relapse, for the terror-speaking seers may once more overcome them. But if men could only be convinced that the soul is born and perishes with us, then they would be able to take their ease, and withstand alike religious scruples and threatenings of the seers. For this purpose we must find out what mind and soul consist of, and how everything on earth proceeds; and if we can do this, we may, of course, dispense with the gods.

[1] i. 641. Thus rendered by Munro:—"For fools admire and like all things the more which they perceive to be concealed under involved language, and determine things to be true which can prettily tickle the ears and are varnished over with finely sounding phrase."

120. First, then, *nothing comes from nothing,* which seems to be meant in the sense that there is a physical cause for everything; at least all the examples which are adduced in proof of the statement are mere instances of what might be conceived to happen if there were no fixed determining physical law or cause. But the author is obscure on this point, for he sometimes makes us inclined to think that he is virtually only asserting the eternal, unchangeable, existence of the atom,—the "first beginning of things."

As a corollary to this, of course, *nature does not annihilate things,* but dissolves them back into their first bodies. The same negative proof is here attempted. Nothing is lost, but nature can beget nothing till she is recruited by the death of something else. Then, to reconcile the reader to the invisibility of these first bodies, he is shown how nature works by invisible things, as wind and moisture; how marriage-rings and paving-stones, ploughshares and statues, are worn away without the loss of any visible particles. Nature, therefore, works by unseen bodies. Smell, heat, cold, etc., must consist of a bodily nature, because they affect the senses; for nothing but body can touch and be touched.

121. But, secondly, *there is also void in things,* else they would be jammed together, and unable to move. It is false to say that things may move in a *plenum:* as, when a fish presses on, it leaves room behind it, into which the water may stream; for on what side can the scaly creature move forwards unless the waters have first made room; and on what side can the waters give place so long as the fish cannot move? (This of course is metaphysics, and is altogether absurd. It is the old story of the immovable body receiving the irresistible blow.) Hence there cannot be motion

unless there be void to allow of a start. Dripping of water in caves, the passage of food throughout the whole body of an animal, the fact that buds and fruit of trees are nourished from the root, voices heard through walls, cold penetrating the very bones, all are proofs that there is void as well as body. Also when one thing is as large as another, but yet lighter, there must be more void in it.

122. THIRD. *There can be no third thing besides body and void.* For if it be to the smallest extent tangible, it is body; if not, it is void.

123. FOURTH. *Bodies are either first beginnings of things* (atoms), *or a union of such.* Any thing which can be broken or crushed, or which can transmit heat or electricity, is partly body and partly void. Hence body cannot be crushed, and "therefore first beginnings are of solid singleness, and in no other way can they have been preserved through ages during infinite time past, in order to reproduce things."

124. FIFTH. If there be no limit to breakage, nothing could be reproduced; for reproduction is slower than decay, and therefore the breaking of infinite past ages would have produced a state of things incompatible with the reproduction of anything within finite time. *Hence there exists a least in things.* This cannot be soft, else it would consist partly of void, and be therefore breakable.

First beginnings, then, are strong in solid singleness. Hence the unreason of those who held fire to be the matter of things, for what surer test can we have than the senses whereby to note truth and falsehood!

The doctrine called that of Homœomeria by Anaxagoras is folly,—his notion, to wit, that everything is made up of little parts the same as itself—bones of little bones, flesh

of little fleshes, etc. For thus corn and other food, which go to nourish our blood, must be in part composed of blood, and must therefore bleed when crushed by the formidable force of the millstone!

125. Sixth. *Are the atoms infinite in number, and is the void in which they move unlimited?* Both questions are answered in the affirmative, but the proof given is metaphysical and altogether ridiculous, though it contains a fragmentary passage of real merit, hinting at Le Sage's explanation (presently to be given) of the cause of gravity. One illustration of it must suffice:—"Nature keeps the sum of things from setting any limit to itself, since she compels body to be ended by void, and void in turn by body;" so that either by the alternation of the two, or by the infinite extension of one if the other do not bound it, immeasurable space must be filled. If, for instance, body were finite, and void infinite, matter would in a very short time be scattered and borne along in the mighty void; or, rather, could never have been brought together.

This agrees with an idea which is propounded in the second book, as to the velocity which the atoms have given them (he does not say how or whence), and which enables them to cohere for a time and then to break up again, as everything wanes. Those whose close-tangled shapes hold them fast together form enduring stone and unyielding iron, others spring far off and rebound, leaving great spaces between; "these furnish us with thin air and bright sunlight." Shortly afterwards, we are told that the velocity of the first beginnings when passing through empty void must be greater than that of sunlight!

We need not trouble ourselves here with Lucretius's speculations as to the formation of tangible bodies from a

vertical downpour of atoms, which, unlike drops of rain, now and then swerve from their courses so as to clash together, save to mention that he affirms that, even if he did not know what atoms are, he could be sure, from its defects, that the world was not made for us by divine power.

126. SEVENTH. This, one of the most important points of the whole theory, is entirely ignored by some good commentators, and by others who have more or less closely followed them :—*The first beginnings of things have different shapes, but the number of shapes is finite.*

127. EIGHTH. *The first beginnings which have a like shape, one with another, are infinite in number.*

That is, there is a finite number of kinds of atoms, but an infinite number of each kind.

128. NINTH. *Nothing whose nature is apparent to sense consists of one kind of first beginnings* (only).

129. We need not trouble ourselves with his notion of the smallness, smoothness, and roundness of the atoms which make up the mind, qualities which he arrives at from the rapidity with which the mind originates and works out a suggestion, contrasting here the mobility of water and the viscosity of honey. Nor his proof (by the non-diminution of the weight and dimensions of the body at death), that the whole mass of the mind must be exceedingly small. But we may quote, in two of its many forms, his constant reiteration of the unreasonableness of the fear of death, and his philosophic mode of overcoming it :—

"Some wear themselves to death for the sake of statues and a name. And often to such a degree, through dread of death, does hate of life and of the sight of daylight seize upon mortals, that they consider self-murder with a sorrow-

ing heart, quite forgetting that this fear is the source of their cares (this fear which urges men to every sin), prompts this one to put all shame to rout, another to burst asunder the bonds of friendship ; and, in fine, to overturn duty from its very base, since often ere now men have betrayed country and dear parents in seeking to shun the Acherusian quarters. For, even as children are flurried and dread all things in the thick darkness, thus we in the daylight fear at times things not a whit more to be dreaded than what children shudder at in the dark, and fancy sure to be. This terror, therefore, and darkness of mind must be dispelled, not by the rays of the sun and glittering shafts of day, but by the aspect and law of nature." Book III. 78.

"Now no more shall thy house admit thee with glad welcome, nor a most virtuous wife and sweet children run to be the first to snatch kisses, and touch thy heart with silent joy. No more mayest thou be prosperous in thy doings, a safeguard to thine own. One disastrous day has taken from thee, luckless man, in luckless wise, all the many prizes of life. This do men say ; but add not thereto : 'And now no longer does any craving for these things beset thee withal.' For if they could rightly perceive this in thought, and follow up the thought in words, they would release themselves from great distress and apprehension of mind. Thou, even as now thou art, sunk in the sleep of death, shalt continue so to be in all time to come, freed from all distressing pains ; but we, with a sorrow that would not be sated, wept for thee, when close by thou didst turn to an ashen hue on thy appalling funeral pile, and no length of days shall pluck from our hearts our ever-enduring grief. This question, therefore, should be asked of this speaker, what there is in it so passing bitter, if it come in the end to

sleep and rest, that any one should pine in never-ending sorrow." Book III. 894.

130. To conclude, there is a great deal in Lucretius (whether his own or derived from others does not matter to us) which is of considerable value, even from a modern scientific point of view, though, of course, of far greater value from the point of view of the student of development. But his attempted proofs are for the most part absurd, based, as they generally are, upon mere metaphysical speculations and altogether preposterous analogies.

131. (2.) Boscovitch and others endeavoured to dispense with the atom altogether, substituting in its place the conception (which mathematicians often find useful) of a mere geometrical point, which is a *centre of force*, as it is called. Here we get rid of the idea of *substance* entirely, but we preserve (all but inertia) those external relations by which alone the atom is capable of making known its presence. Even so great an experimental philosopher as Faraday may be quoted as, to some extent at least, agreeing with this notion. It seems to us, however, that this is the embodiment of an over-refinement of speculation, surrounded on almost all sides by the gravest difficulties. It may suffice merely to mention again the property of mass, or inertia, which Faraday himself seemed to look upon as the *one* essential characteristic of matter, and which we can hardly bring ourselves to associate with the absence of what we understand by substance.

132. (3.) Another speculation leads us to imagine matter as not ultimately atomic—as, in fact, infinitely divisible. But, if it be so, it must (in order that various elementary physical facts may be capable of explanation) be practically continuous but intensely heterogeneous. That solid

or liquid matter has a grained structure of not infinitely small dimensions is proved by many simple and generally known facts; among others by the separation of white light into its constituent colours when refracted through a prism, by the phenomena of capillarity, and by those of contact electricity. If such heterogeneity were only pronounced enough, it appears that the law of gravitation would be capable of accounting for at least the greater number of effects at present attributed to the so-called molecular forces and the force of chemical affinity. Here, however, we are met by the grand difficulty, that of accounting for gravitation. And the only attempt at explanation of gravitation-attraction, which can be called even plausible, can only, with very great straining, be made compatible with this idea of the nature of matter.

133. (4.) The fourth and most recent speculation revives the atom (in the literal sense of the word), but not "strong in solid singleness" like those contemplated by Lucretius, —much rather yielding to the least external force, and thus escaping from the knife or wriggling round it, so that it cannot be cut,—not, however, on account of its hardness, but on account of its mobility, which makes it impossible for the knife to get at it.

This is the vortex-atom theory of Sir W. Thomson, dimly foreshadowed in the writings of Hobbes, Malebranche, and others, but only made distinctly conceivable in very recent times by the hydrokinetic researches of Helmholtz. Helmholtz, in 1858, first successfully attacked the equations of motion of an incompressible frictionless fluid, without introducing the great simplification which had been adopted by his predecessors, and which consisted in supposing the motion to be non-rotational. He proved,

among other valuable results, that those portions of the fluid which at any time possess rotation preserve it for ever, and are thus as it were marked off from the others; also that these portions must be arranged in filaments whose direction is at each point the axis of rotation, and that the filaments are either endless, *i.e.* form closed curves (whether knotted or not), or terminate in the free surface of the fluid.

Hence Sir William Thomson's idea that what we call matter may consist of the rotating portions of a perfect fluid, which continuously fills space. This definition involves the necessity of a creative act for the production or destruction of the smallest portion of matter, because rotation can only be produced or destroyed by us in a fluid in virtue of its viscosity (or internal friction), and in a perfect fluid there is nothing of the kind.

134. Of course it may be objected to this theory that it merely shifts the difficulty one step further back,—after all, explaining what we call matter by certain motions of something which, as it must have inertia, it would appear we are bound to call matter also. We have mentioned this (latest) speculation as to the nature of matter for two reasons: 1st, because it shows one way of at once thoroughly accounting for the conservation of tangible matter; 2d, because it shows the possibility of forming an idea of a true atom which shall not require, even for perfect elasticity, the inconceivable quality of perfect hardness necessary to the atom of Lucretius. In fact, the few words which we have given above about Helmholtz's investigations show that, to cut a vortex atom, it would be necessary to give a free surface to the perfect fluid which on this theory is supposed to fill space, *i.e.* virtually to sever space itself! This

idea promises to be very valuable from one point of view at least, viz., the extension and improvement of mathematical methods; for in its very elements it requires the application of the most powerful of hitherto invented processes, and, even with their aid, the mutual action of two ring-vortices (the simplest possible space-form) has not yet been investigated except in the special cases of symmetrical disposition about an axis. Hence we are at present altogether unable to guess whether this idea will or will not pass with credit some of the most elementary examinations to which a theory of the ultimate nature of matter must of course be subjected.

135. Take them for what they are worth. The four forms of speculation we have just sketched represent the most plausible guesses yet propounded as to the ultimate nature of matter, the second being, probably because the most artificial and the most arbitrary, the most completely developed. For in it the representation is self-contained as it were; it does not base itself upon extraneous postulates, as of ultimate hard particles (of what?), nor upon vortex motion (of what? again), nor, finally, upon mere intense heterogeneity (of what? once more), as do the other three. But we naturally object to it as refining away altogether the idea of *stuff* or *substance* which the mind seems to require as something underlying the notion of anything which is found to be directly capable of affecting our senses.

136. The reader who has followed us so far, must now see that our notions of the nature of matter are, at best, but hazy. We know, it is true, a great many of its properties very exactly, so much so indeed, as to be able to deduce from them mathematically an immense variety of con-

sequences which subsequent experiment shows to be correct, at least within the limits of accuracy of our methods of observation and measurement. But as to *what it is* we know no more than Democritus or Lucretius did, though as to what it may be or may not be we are perhaps considerably better prepared with an opinion than they could possibly be.

137. We have seen in the preceding chapter that energy is never found separate from matter, so that we might, with perfect propriety, define matter as the seat or vehicle of energy—that which is essential to the existence of the known forms of energy, without which, therefore, there could be no transformations of energy, and therefore no *life* such as we now know it.

138. Now the transformability of a given amount of energy, or, at least, the modes of its transformation, depend in a very curious manner upon the relative quantity of matter with which it is associated. A pillow or bolster (stuffed with eider-down, let us say) of 30 lbs. weight, and moving at 10 feet per second—*i.e.* as if it had fallen from a height of considerably *less than two feet*,—has nearly the same energy as a pellet of No. 1 shot when it leaves the muzzle of a fowling-piece. How different the quality of these equal quantities even of energy of the same kind! Yet, delivered horizontally, the one would correspond to a staggering push which few men could resist if it came unexpectedly; while the other would scarcely affect one's equilibrium, though it might easily kill by penetrating a vital organ. [In the brutal pastimes of the last generation, as we now in our advanced humanitarianism call them, this was well known as the difference between the effects of a slow knock-down blow by a heavy-weight, and a "punishing facer" from a feather-

weight. Alas for the good old times! for our comparison, apt as it is, is too probably thrown away on the degenerate inhabitants of (once) merry England, erewhile the home of the "Miller," with his honest quarterstaff, of jolly and chivalrous wrestlers, boxers, and bowmen, now the hell of running-kicks, garrotting, gouging, and stabbing.

> Aetas parentum, pejor avis, tulit
> nos nequiores, mox daturos
> progeniem vitiosiorem.

The dissipation of energy is a great fact in a moral as well as in a physical sense. In those good old times *men* fought with *men*,—irrepressible energy, rather than any sordid passion or uncontrolled vice, constantly pulling the trigger! *Now* creatures in the likeness of men vent their despicable passions in murderous assaults upon women and children. But science hints at an effectual cure. It is probable that before many years have passed, electricity, which by some mysterious means enables our nerves to call our muscles into play, which enables us to converse with one another at distances of thousands of miles, which alike plates the teaspoon and illumines the lighthouse, will be called upon by an enlightened legislature to produce absolutely indescribable torture (unaccompanied by wound or even bruise), thrilling through every fibre of the frame of such miscreants.]

139. After inertia, which is not accounted for by any of the hypotheses as to the ultimate nature of matter which we have just given, the most general property of matter which we recognise is that of universal gravitation, in virtue of which portions of matter, if situated at a distance from one another, are possessed of potential energy. We are apt to hold exaggerated notions of the immense power of gravity;

but a little consideration will show us that it is in reality one of the most trivial of the forces to which matter is directly or indirectly subject.

Think for a moment of the fundamental experiments in electricity and magnetism, known to men for far more than 2000 years,—the lifting of light bodies in general by rubbed amber, and of iron filings by a loadstone. To produce the same effects by gravitation-attraction,—at least if the attracting body had the moderate dimensions of a hand-specimen of amber or loadstone,—we should require it to be of so dense a material as to weigh at the very least 1,000,000,000 lbs., instead of (as usual) a mere fraction of a pound. Hence it is at once obvious that the imposing nature of the force of gravity, as usually compared with other attractive forces, is due not to its superior qualitative magnitude, but to the enormous masses of the bodies which exercise it.

In fact, the excessively delicate Torsion-balance of Michell was absolutely requisite to demonstrate, much more to measure, the mutual attraction between a large and a small leaden sphere. And (unless the third of the hypotheses as to the nature of matter above given be correct, in which case the *form* of our statement would require modification) small or even moderately large pieces of matter are held together entirely by cohesion, gravitation being absolutely insensible; though in a huge mass like the earth, the force exerted by one hemisphere on the other (*i.e.* the force which would be called into play to prevent its being split in two) depends mainly upon gravitation, in comparison with whose enormous amount even a cohesive force of 500 lbs. per square inch over a circular surface of 4000 miles radius sinks into utter insignificance!

140. One only of the many hypotheses which have been advanced to explain the cause of gravitation has succeeded in passing the first preliminary tests. Of course, the assumption of action at a distance may be made to account for anything; but it is impossible (as Newton long ago pointed out in his celebrated letters to Bentley) for any one "who has in philosophical matters a competent faculty of thinking" for a moment to admit the possibility of such action.

Hence we have but two ways of accounting for gravitation :—either it is due to differences of pressure in a substance continuously filling all space, except where matter displaces it (?), or it is due to impacts, in some respects analogous to those of the particles of a gas which have been found to be capable of accounting for gaseous pressure.

Now, all attempts as yet made to connect it with the luminiferous ether, or the medium required to explain electric and magnetic distance-action, have completely failed; so that we are apparently driven to the impact theory as the only tenable one.

141. To this theory Le Sage of Geneva devoted a singularly acute mind during the whole of his exceptionally long life; but, for all that, his posthumous tract on the subject is but little in advance of the results he had arrived at in his eighteenth year.

He assumes the existence of ultra-mundane corpuscles; in infinite numbers, even compared with those of the particles of matter; of dimensions excessively small, but flying about in all directions with velocities enormously great. Portions of gross matter virtually screen one another to a certain extent from the pressure due to this perpetual rain of corpuscles; but only on the sides turned towards one another. Hence a lone body would be equally battered on all sides;

but the introduction of a second mass interferes with this arrangement, and diminishes the pressure on the side next it. It is easy to show that the amount of this diminution, for *given small masses*, is inversely as the square of their relative distance. But when larger masses are taken account of, this diminution of pressure will not be (as gravity is) directly as the quantities of matter present, unless the further assumption is made that matter, whether by the great distance between its particles, or by the cage-like form of these particles, is almost perfectly permeable to the corpuscles; so that, practically, the corpuscles rain upon the interior particles of a mass as freely as if each of them had been alone in space.

Some of the postulates of this theory are hard to grant, and there is additional difficulty as to the mode in which the supply of energy of the corpuscles is to be kept up. To enter into details on this subject is not in accordance with our plan. We therefore refer the reader to Sir W. Thomson's account of Le Sage's theory (Proc. R.S.E., 1871), and his suggestions for its improvement, based upon his theory of vortex-atoms.

142. But we must make one remark. If Le Sage's theory, or anything of a similar nature, be at all a representation of the mechanism of gravitation, a fatal blow is dealt to the notion of the tranquil form of power we have called *potential* energy. Not that there will cease to be a profound difference in kind between it and ordinary *kinetic* energy; but that BOTH will be henceforth to be regarded as kinetic. What we now call kinetic energy is that of visible motions, also of motions of the smaller parts of bodies, and of the luminiferous ether, etc., each of these being more refined, as it were, than the preceding. But if Le Sage's theory be true,

potential energy of gravitation is a kinetic form still further refined than any of these. And the conservation of energy may perhaps once more be completely and accurately expressed as the conservation of *vis viva*, though the term will of course have then a meaning incomparably more extensive than its original one.

143. But, in speculations like these, we have soared far beyond that which may be called the first refinement on ordinary gross matter; *i.e.* the luminiferous, probably also the electric and magnetic, medium, provisionally the *Ether*.

To the consideration of its principal properties we now turn our attention.

These are, at first sight at least, of an apparently incongruous character; for, from one point of view, the ether appears as a fluid, from another as an elastic solid. Nothing is more certainly established in physical astronomy than the excessive minuteness of the resistance offered by the ether to the planetary motions, if, indeed, there be such a resistance at all appretiable, even when these motions are, as in the case of the earth, somewhere about 100,000 feet per second! On the other hand, we learn from physical optics that light, transmitted with a velocity of 188,000 miles per second, depends upon transverse disturbances of some kind or other; while several optical phenomena indicate that a disturbance of the nature of compression (if such be possible) would be transmitted with velocity almost infinitely great, in comparison even with this enormous velocity.

144. Stokes, however, has given a very ingenious illustration which enables us to see that such an extraordinary combination of apparently irreconcilable properties is by no means without analogy, even in common matter. He takes the case of a solution of glue, or isinglass, or jelly, in

different relative amounts of water. When the quantity of water is small, we have the elastic solid; when large, a liquid little different from water. And Stokes shows that it is excessively improbable that there is any definite intermediate stage which we could assign as that at which the transition from the solid to the liquid takes place. Of course, any such analogy must necessarily be excessively imperfect; but a great deal is gained by our being able to trace even a very imperfect analogy in a case like this.

145. The ether, in fact, must be distorted as well as displaced by matter passing through it; but any distortion of the nature of a shear, such as would give rise in water to vortex-motion accompanied by friction (the whole energy being thus ultimately frittered down into heat), would in the ether be handed on at once, as vibratory motion, with the velocity of light. Thus vortex-motion of the ether may be conceived to be impossible, simply in consequence of the minuteness of its density in comparison with the great tangential force called into play by a shear; and a body moving in it with a velocity not so great as that of light would thus not have eddies in its wake, as in an ordinary fluid, but, on the contrary, would be a source of radiation, even although there may have been no heating either of the body or of the medium it is displacing, paradoxical as this result may appear.

146. Sir William Thomson has endeavoured to obtain at least an inferior limit to the density of the ether in planetary space. His method is based upon the measurements by Pouillet and Herschel of the whole amount of radiant energy received from the sun by a given amount of surface in a given time, and upon an assumption that the extreme amplitude of distortion of the ether in any radiation is

small compared with the length of a wave. In this way he finds that, as a cubic mile of the ether near the earth contains about 12,000 foot-pounds of radiant solar energy, the mass of the ether in that cubic mile must be at least $\frac{1}{1,000,000,000}$ of a pound.[1] To show that this is not by any means a surprisingly small quantity, he compares it with the mass of a cubic mile of air at a distance of only a few radii from the earth's surface (supposing that the atmosphere extends so far). This, he finds, will be probably represented by a fraction of a pound having unit for a numerator and 329 places of figures in the denominator!!!

147. In a very remarkable paper by Struve,[2] an attempt was made to settle the question, *Is the ether perfectly transparent?* or, as we may now put it, Is any radiant energy absorbed by the ether, whether to produce other forms of energy, or to be dissipated by radiation in all directions? Long ago it had been pointed out by Olbers and others, that if the stars be infinite in number, and be distributed with anything roughly approximating to an average density through infinite space, the sky ought, night and day, to be all over of a brightness of the same order as that of the sun. Is the number of stars, then, finite; or does the ether absorb their light? Now, it need not in the least surprise us to find that the number of stars is *finite*, even though matter be infinite in quantity, and distributed with something like uniformity through infinite space. For only a finite portion of it may yet have fallen together so as to produce incandescent bodies; or, the other extreme, only a finite portion of it may be left incandescent. Either of

[1] Here it is important to observe that the speculations of Sir W. Thomson with regard to the density of the Ether assign only the inferior limit of that density. The *real* density may possibly be very much greater.

[2] *Études d'Astronomie Stellaire*, 1847.

these altogether different hypotheses is perfectly reasonable and scientifically justifiable; so that, from this point of view, we are not at present likely to obtain any information. Struve's reasoning, which, by the way, is not accepted by Sir J. Herschel, introduces another consideration, viz., *the numbers of stars of each visible magnitude.* To apply this: suppose for a moment we make the assumption (actually measured values of annual parallax show it is certainly at best a very rough one) that the brighter stars are the nearer, and that a set of stars, on the average one-fourth as bright as another set, are on the average twice as far off, etc. A great deal of what we know to be certainly false is here assumed as true, but it is possible that the general accuracy of the results of the reasoning from it may not be thereby much affected. On the supposition of a sort of rough uniformity of distribution through space, we can easily calculate approximately what ought to be the relative numbers of the stars, classed by astronomers as of the various different magnitudes, once we have obtained (as it is not difficult to do) an estimate of the relative brightness of typical stars of these (arbitrary) magnitudes. From their brightness we calculate at once their relative distances, and thence (according to our hypothesis of approximately uniform distribution) what ought to be *the relative numbers of each magnitude.* When this is done, it appears that there is a great excess of the calculated over the observed numbers, at least for telescopic stars, and the greater the smaller the magnitude. This is the gist of Struve's method, and he arrives at the result that the light of stars of the sixth magnitude (the smallest visible to an ordinary unaided eye, and whose average distance from us is supposed to be somewhere about ninefold that of stars of the first magnitude)

loses about eight per cent. in its passage to the earth. Thus the light of stars of the first magnitude does not lose so much as one per cent.; but, on the other hand, stars of the ninth magnitude are enfeebled to the extent of about 30 per cent. Struve shows that, if his result is to be accepted, W. Herschel's idea that his 40-foot telescope would show him stars seven times further off than those visible with the 10-foot, was erroneous. He would, in fact, have been able to see little more than *twice* as far.

It will be obvious now that an enormous increase of the so-called *space-penetrating* power of a telescope gives it in reality but a very feeble additional advantage, in fact, that, if there be absorption by the ether, we have already instruments capable of showing us, at the very least, half of the whole number of stars which any conceivable improvement of telescopes would enable us to see.

148. It would be out of place here to speculate on what becomes of the light thus supposed to be absorbed, for we have as yet no experimental bases on which to reason. We have not the least idea, for instance, what is the effect of change of temperature in the luminiferous ether. That it is practically incompressible we know; it is quite probable that it may not be sensibly compressed (if it be subject to gravity, of which we have no proof) even by the attraction of the mass of the whole earth—though, so great is the intensity of molecular or cohesive attraction, we may easily conceive that in the interior of bodies the ether may be considerably compressed. And it is not improbable that the ether, as a whole, may have, in virtue of its internal forces, a property (akin, as it were, to a liquid film) such that the gravitation action, which appears to be between particles of matter, may merely be the visible result of a tendency to a mini-

mum of some affection of the fluid in which they are immersed. Regard it as we please, there can be no doubt that the properties of the ether are of a much higher order in the arcana of nature than those of tangible matter. And as even the high-priests of science still find the latter far beyond their comprehension, except in numerous but minute and often isolated particulars, it would not become us to speculate further. It is sufficient for our purpose to know from what the ether certainly does that it is capable of vastly more than any one has yet ventured to guess.

149. If we review the attempts recorded in this chapter we see how the scientific mind is led from the visible and tangible to the invisible and intangible.

In the first place, we know that one body, such as the sun, can part with its radiant energy to another body, such as the earth, and observation and experiment alike lead us to acknowledge a stage in which the energy has left the one body and has not yet arrived at the other. But this means that there is something between these two bodies capable of moving and transmitting energy, and therefore, from the very conception of energy, possessing mass—this something we agree to call the ethereal medium.

Again, we know that different masses of visible matter attract one another apparently at a distance. Our first attempt is to analyse the nature of this force. Does it proceed from the surfaces of the attracting bodies, or does it penetrate their entire mass? This question was answered by Newton, who came to the conclusion that every particle of matter attracts every other particle with a force proportional on the product of their masses, and inversely proportional to the square of their distances.

But this only drives the mystery of gravitation from the

mass to the particle, and here the same set of questions again occur. A particle as truly as a mass occupies space, and we wish to know if the force proceeds from the surface of the particle or from its interior.

150. Then again we likewise wish to know how this force is communicated between one particle and another? Now before we can solve these questions we must have some definite conception of the nature of a particle and of the constitution of the surrounding medium. Sir W. Thomson, as we have seen, has attempted to advance towards the nature of an atom or particle in his supposition that atoms are vortex-rings generated out of a perfect fluid filling all space. While, however, this conception accounts for some of the properties of an atom it does not easily account for gravitation, and hence he adopts in addition the hypothesis of ultra-mundane corpuscles, which he supposes to be only a finer form of vortices.

151. There is, however, one objection to the precise form of vortex-ring hypothesis introduced by Thomson which from our point of view is very strong. The act by which the atom was produced must necessarily by this hypothesis have been an act of creation (Art. 133) in time, that is to say, an act impressed upon the universe from without, and it must therefore have denoted a breach of continuity (Art. 85); for if the invisible universe be nothing but a perfect fluid, can we imagine it capable of originating such a development in virtue of its own inherent properties, and without some external act implying a breach of continuity?—we think not. In the production of the atom from a perfect fluid we are driven at once to the unconditioned—to the Great First Cause; it is, in fine, an act of creation and not of development. But from our point

of view (Art. 86) creation belongs to eternity and development to time, and we are therefore induced to modify the hypothesis so as to make it consistent with this view. We cannot, in fact, if we agree to hold at the same time the principle of unbroken continuity and the vortex-ring theory of formation of the visible universe, regard the invisible universe as an absolutely perfect fluid.

152. This way of regarding the invisible universe is strengthened by the fact that the hypothesis which seems most likely to account for gravitation presumes the existence of ultra-mundane corpuscles, and the observations of Struve upon the extinction of star-light tend (whatever they are worth) towards the same conclusion, since the absorption of light is more compatible with a corpuscular constitution than with that of a perfect fluid. But if the visible universe be developed from an invisible which is not a perfect fluid, then the argument deduced by Sir W. Thomson in favour of the eternity of ordinary matter disappears, since this eternity depends upon the perfect fluidity of the invisible. In fine, if we suppose the material universe to be composed of a series of vortex-rings developed from an invisible universe which is not a perfect fluid, it will be ephemeral, just as the smoke-ring which we develop from air, or that which we develop from water, is ephemeral, the only difference being in duration, these lasting only for a few seconds, and the others it may be for billions of years.

153. Thus, in our last chapter, we came to the conclusion that the available energy of the visible universe will ultimately be appropriated by the invisible, and we may now perhaps imagine, at least as a possibility, that the separate existence of the visible universe will share the same fate,

so that we shall have no huge useless inert mass existing in after ages to remind the passer-by of a form of energy and a species of matter that is long since out of date and functionally effete. Why should not the universe bury its dead out of sight ?

CHAPTER V.

DEVELOPMENT.

"Are God and Nature then at strife,
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life;
. . . . . .
. . . . . .
"'So careful of the type'? but no,
From scarped cliff and quarried stone
She cries, 'A thousand types are gone:
I care for nothing, all shall go.'"—TENNYSON.

"*All nature is but art*, unknown to thee;
All chance, direction, which thou canst not see,
All discord, harmony not understood;
All partial evil, universal good;
And spite of pride, in erring reason's spite,
One truth is clear, whatever is, is right."—POPE.

154. IN Chapters III. and IV. we have dwelt upon the laws of energy and the ultimate constitution of matter; in other words, we have discussed those laws according to which the machine called the visible universe works, as well as the probable nature of that material of which it is composed. We have in this process (Arts. 86, 151) come to the conclusion that the visible universe has been developed out of the invisible. Once developed, it has its own laws of action which we may discover,—laws which at present appear to be invariably followed, as far at least as our strictly scientific experience can inform us.

In fine, the visible universe is that which we are in a

position to observe, gaining an insight into its present method of working, and trying also to reply to that very interesting question, Has it always worked in its present manner, or has there ever been any apparent break ?

Let us, therefore, take this visible universe after its production, and endeavour to become acquainted with the course of its development. What did it do ? Was it entirely left to itself, and to what may be termed the natural laws impressed upon it when it was produced ?

In replying to these questions, let us, for the sake of convenience, consider development under the three following heads, viz., (α) Chemical or Stuff Development, (β) Globe Development, (γ) Life Development.

155. To begin with chemical or stuff development, we come at once to a very interesting and important question. Assuming that the atoms of the present universe were developed from the invisible, were different kinds of atoms thus developed, or were they all of one kind ?

To this question the chemist of last century would have replied :—Undoubtedly there were many kinds of primeval atoms, and then would follow a list of all these various substances which he was unable to decompose.

The chemist of thirty or forty years later would still reply to the question in the same way, but he would probably have a different list of primeval elements less formidable in number.

If the chemist of forty years ago were asked, he would have furnished a list of perhaps fifty simple substances; but then, probably, the minimum would have been reached; for ask the chemist of to-day, and he will furnish a list of sixty-three elements.

156. But while the number of undecomposed bodies is

slowly increasing, chemists are beginning to speculate as to the possibility of these so-called elements being in reality nothing else than combinations of some kind of primordial atoms.

This idea was first entertained by Dr. Prout, the well-known physician and chemist. He pointed out that the atomic weights of the various so-called elements are very nearly all multiples of that of the half of hydrogen, so that they may possibly be looked upon as formed by a grouping together of certain atoms of half the mass of the hydrogen atom.

M. Stas, the distinguished Belgian chemist, instituted a laborious series of experiments with the view of testing this doctrine. He came to the conclusion that the atomic weights of the various elements were not precisely multiples of that of the half of hydrogen, there being greater differences than could possibly be accounted for by errors of experiment. His researches, however, seemed to show that in many cases there was a very near approach to Prout's imagined law. But in no case does the discrepance appear greatly to exceed what may easily be attributed to unavoidable impurities in the substances operated on ; say only those due to the condensation of gases in the pores of solids, which (in certain cases at least) is known to amount to a very considerable quantity.

157. From another point of view, there appears to be evidence in favour of the so-called elementary bodies being built up.

There are certain groups or families amongst these elements of such a nature that the various members of one family appear to be related to each other, in the same way as the corresponding members of another family.

This clearly points to some sort of community of origin, and thus favours the idea that the elements are in reality composite structures. But the great difficulty in the way of this idea has been the apparent impossibility of decomposing such family groups. Thus fluorine, chlorine, bromine, and iodine, while they appear to be related to one another in some peculiar manner, have yet resisted all attempts at decomposition, and there are other similar instances that might be named.

158. It has, however, at the same time, come to be recognised, that high temperature is a very powerful decomposing agent, and that its office is by no means limited to causing the separation from one another of the molecules of a substance, as, for instance, when it separates the molecules of water or H_2O from one another in the case of steam. It is now understood that high temperature has also the power of separating the atomic constituents of a single molecule from each other, so that at an extremely high temperature water would not only be driven into steam, but steam driven into oxygen and hydrogen. We are already familiar with many instances of this power possessed by high temperature ; thus we see that carbonate of lime is decomposed by the heat of the kiln into lime and carbonic-acid gas. We see also that at the high temperatures which accompany the electric spark almost all compounds are momentarily decomposed, if we may judge by the spectrum of the light which is given out. Carrying on this line of thought, we are led to imagine that, could we obtain higher temperatures than those now at our disposal, we might decompose some of those substances which at present seem to be elements.

159. Lockyer, in his astronomical researches, has recently started this question. He argues that in the sun and some

of the brighter stars we are furnished with temperatures very much higher than anything which has been here produced. He assumes too that simplicity of constitution accompanies a simple spectrum, an hypothesis which is verified by the fact that compounds all give spectra much more complicated than simple substances. Now it is a curious circumstance that some of the brighter stars, such as Sirius, do not appear to contain anything but hydrogen; at least we have no indication that they do; other stars again of less brilliancy, in addition to hydrogen, have such substances as iron, sodium, etc., while stars of unmistakeably less brilliancy, including coloured and variable stars, appear to contain in their atmospheres substances which are compounds. If then it be true that as a rule the most brilliant stars contain the fewest elements and those of smallest atomic weight, and that as stars diminish in brilliancy they rise in complexity of structure, in fine, if we have reason to associate together brilliancy and simplicity this undoubtedly tells in favour of the power of high temperatures to split up the so-called elements.

No doubt it may be said that the brightest stars may only be those nearest to us, but there is also ground for supposing that they may be the hottest stars, in the fact that their spectra contain a greater proportion of the more refrangible rays than do those of yellow or red stars.

In fine, a speculation of this nature is not to be summarily dismissed, but ought to be retained as a working hypothesis which may throw light on the ultimate constitution of the chemical elements.

160. Let us now turn to globe development. We have alluded to this already when discussing the energy of the universe. In doing so we came to the conclusion that the

original state of the visible universe was a diffused or chaotic state, in which the various particles were widely separated from one another, but endowed with the force of gravitation, and therefore possessed of potential energy. As these particles condensed or came together, this potential energy was gradually transmuted into the energy of heat and into that of visible motion. We may thus imagine the cooling and revolving matter in course of time to have thrown off certain parts of itself which would thereafter form satellites or planetary attendants, while the central mass would form the sun. We have here, in fact, the development hypothesis of Kant and Laplace, and it is greatly in favour of the truth of this hypothesis that all the planetary motions of the solar system are nearly in one plane, and also that, looking down on the system from above, all these motions are seen to be in one direction.

161. Assuming, therefore, that the solar system and, *pari passu*, the other sidereal systems have been formed in this way, it is very easy to see why the central mass should be so much hotter than its attendants. Two causes would conduce to this. In the first place, assuming that the heat of a mass is due to the rushing together of its particles under the force of gravitation, the velocities would be much greater for the central mass, and hence the heat developed would be greater also. In the next place, the body being a large one would cool less rapidly than its attendant planets. These two causes combine to render the largest bodies of the universe originally (and still more now) the hottest, so that the same body which forms the gravitating centre of the system becomes also the dispenser of light and heat.

162. Now, without speculating about the nature or extent

of the ethereal medium, we may be sure of two things. In the first place, a large amount of the light and heat of the sun and stars goes out into space and does not return to them again, or in other words, the sun and stars are slowly cooling. In the next place, the visible motion of the large bodies of the universe is gradually being stopped by something which may be denominated ethereal friction. It follows from this that our own sun will gradually lose his brilliancy, and that our earth will gradually lose its orbital energy and approach the sun by a slow spiral motion. At last it will become entangled with the sun, and the result will be the conversion of the remaining orbital energy into heat, after which the two bodies will remain one.

Thus the tendency is that the sun shall ultimately absorb the various planets of the system, his heat and energy being recruited by the process. Now, let us imagine that the same process is simultaneously going on in one of the nearer fixed stars, say for instance in Sirius.

After unimaginable ages these two stars, the Sun and Sirius, having each long since devoured his attendants, but being nevertheless exhausted in heat-energy on account of radiation into space, may be imagined to be travelling towards one another, slowly at first, but afterwards with an accelerated motion.

They will at last approach each other with a great velocity, and finally form one system. Ultimately the two will rush together and form one mass, the orbital energy of each being converted into heat, and the matter being, in consequence, probably evaporated and transformed into a gaseous, nebulous condition. Ages pass away, and the large double mass ultimately shares the same fate that long since overtook the single masses which composed it; that

is to say, it gives out its light and heat into space and becomes dark, until at length it comes to form one of the constituents of a still more stupendous collision, and has its temperature raised once again by the conversion of visible energy into heat.

163. Our readers will remark how, by a process of this kind, the primordial potential energy of the visible universe is gradually converted into light and heat, and how this light and heat are ultimately dissipated into space. They will also remark that, as the process proceeds, the masses of the universe become larger and larger. In fine, the dissipation of the energy of the visible universe proceeds, *pari passu*, with the aggregation of mass.

The very fact, therefore, that the large masses of the visible universe are of finite size, is sufficient to assure us that the process cannot have been going on for ever; or, in other words, that the visible universe must have had its origin in time, and we may conclude with equal certainty that the process will ultimately come to an end. All this is what would take place, provided we allow the indestructibility of ordinary matter; but we may perhaps suppose (Art. 153) that the very material of the visible universe will ultimately vanish into the invisible.

164. There is one peculiarity of the process of development now described, which we beg our readers to note. We have supposed the visible universe, after its production, to have been left to its own laws; that is to say, to certain inorganic agencies, which we call forces, in virtue of which its development took place. At the very first there may only have been one kind of primordial atom, or to use another expression, perfect simplicity of material. As, however, the various atoms approached each other, in virtue of the forces with

which they were endowed, other and more complicated structures took the place of the perfectly simple primordial stuff. Various molecules were produced at various temperatures, and these ultimately came together to produce globes or worlds, some of them comparatively small, others very large. Thus the progress is from the regular to the irregular. And we find a similar progress when we consider the inorganic development of our own world. The action of water rounds pebbles, but it rounds them irregularly; it produces soil, but the soil is irregular in the size of its grains, and variable in constitution. Wherever what may be termed the brute forces of nature are left to themselves, this is always the result; not so, however, when organisms are concerned in the development. Two living things of the same family are more like each other than two grains of sand or two particles of soil. The eggs of birds of the same family, the similar feathers of similar birds, the ants from the same ant-hill, have all a very strong likeness to each other.

This likeness is still more marked if we regard certain products of human industry. Let us take, for instance, coins from the same die, or bullets from the same mould, or impressions from the same engraved plate, and we at once perceive the striking difference between products developed through inorganic means and those developed through an intelligent agent designing uniformity.

165. Let us now proceed to consider life development. Let us imagine that the primeval atoms have long since come together, various chemical substances being the result. And let us further imagine that these various substances have long since gathered themselves into worlds, of various sizes at first; but these worlds have gradually cooled down,

until one of them, the Earth, let us say, has at length reached conditions under which life (such as we know it) becomes possible. Accordingly life makes its appearance; not the life that now is, but something much ruder and simpler. But in process of time we find quite a different order of organised beings; a higher and more complete type has appeared, and the type continues to rise until it culminates in the production of man, a being endowed with intelligence, and capable of reasoning upon the phenomena around him. Now, if man reviews these organised forms which exist on the earth side by side with himself, he perceives at once that a number of individuals possess certain characteristics in common, and he gives expression to this experience by saying that these individuals are all of one species. "When we call a group of animals or of plants a species," says Professor Huxley,[1] "we may imply thereby, either that all these animals or plants have some common peculiarity of form or structure; or we may mean that they possess some common functional character. That part of biological science which deals with form and structure is called Morphology; that which concerns itself with function, Physiology. So that we may conveniently speak of these two senses, or aspects, of 'species'—the one as morphological, the other as physiological. . . . Thus horses form a species, because the group of animals to which that name is applied is distinguished from all others in the world by the following constantly associated characters:—They have, 1. a vertebral column: 2. mammae; 3. a placental embryo; 4. four legs; 5. a single well-developed toe in each foot, provided with a hoof; 6. a bushy tail; and 7. callosities on the inner sides of both the fore and the hind legs. The

[1] *Lay Sermons, Essays, and Reviews.*

asses, again, form a distinct species, because, with the same characters, as far as the fifth in the above list, all asses have tufted tails, and have callosities only on the inner side of the fore legs."

But very often the morphological peculiarities of a species are more easily recognised than expressed. No one, for instance, would fail to rank the horse as one species and the ass as another, even while ignorant of some of those specific peculiarities which the naturalist selects as conveying the best scientific account of their difference.

166. Let us now regard the question of species from its physiological point of view. Suppose that two individuals, A and B, of different sexes, breed freely together, producing offspring, and that two individuals, C and D, do the like.

Now, if the offspring of A and B is capable of breeding freely with that of C and D, producing offspring, generation after generation, then A, B, C, and D may be said to belong to the same physiological species.

To take an illustration borrowed from Professor Huxley: let us imagine that A is an Arab, and B a dray-horse; also that C is a dray-horse, and D an Arab. Now the progeny of these two pairs will all be mongrels, holding a position intermediate between that of the Arab and the dray-horse; but they will be perfectly fertile amongst themselves when matched together. We therefore conclude that the dray-horse and the Arab are not distinct physiological species, but only varieties of the same species. Again, let A be a horse and B an ass, also let C be a horse and D an ass. The pairs will still have offspring, and these will be mules, having a character intermediate between that of the horse and that of the ass; but, on the other hand, these mules will not be able to breed together amongst themselves so as to

produce offspring. We are therefore justified in asserting that a horse and an ass are of different physiological species.

If we should ever attempt to pair together animals much more unlike each other than the horse and the ass, we should simply fail. They will not come together, and we cannot tell whether, if they did, they would be capable of producing progeny. We may therefore conclude that, as matter of fact, there are certain well-marked physiological species that will not breed with each other at all, while there are other species also physiologically distinct, but not so markedly separated from each other, that may be brought to breed together, their offspring being infertile.

167. The most apparent conclusion to be deduced from these facts would be that of the invariability of species, and of the impossibility of its transmutation—the infertility of hybrids being the law that prevents any such transmutation taking place. And as the physiological species cannot be made different, the apparent conclusion is that in times past they have been always the same as they are now. If this be allowed, it follows that inasmuch as they took their origin in time, they must have originally been produced very much as they are at the present moment,—a separate act of production being required for each species, or rather two separate acts for each species. This position has always been regarded as a stronghold by a certain class of theological thinkers, and they have resented the attempts of men of science to obtain any other explanation of the origin of species.

Men of science have, on the other hand, asserted their right to discuss this question with the same freedom as any other. Our point of view is somewhat different from that of either of these two parties. We think it is not so much

the right or privilege as the bounden duty of the man of science to put back the direct interference of the Great First Cause—the unconditioned—as far as he possibly can in time. This is the intellectual or rather theoretical work which he is called upon to do—the post that has been assigned to him in the economy of the universe.

If, then, two possible theories of the production of any phenomenon are presented to the man of science, one of these implying the immediate operation of the unconditioned, and the other the operation of some cause existing in the universe, we conceive that he is called upon by the most profound obligations of his nature to choose the second in preference to the first. But we have already sufficiently discussed this question in a previous part of this book (Art. 85).

168. When we examine closely into the phenomena of life we find that side by side with the general law, that like produces like, there is a tendency to minor variations.

Thus we have already agreed to consider dray-horses and Arabs as varieties of the species horse; and in like manner pouters, carriers, fan-tails, and tumblers are all varieties of the species rock-pigeon. We are therefore led to ask how such varieties were originally produced and how they become perpetuated after their production.

Now it is well known that there occurs occasionally an unaccountable variation, so marked in its nature as to be worthy of historical record. Two very interesting and instructive instances of this are given by Professor Huxley, and we take the liberty of quoting these in the Professor's own words :—

"The first of them is that of the 'Ancon,' or 'Otter' sheep, of which a careful account is given by Colonel David Humphreys,

F.R.S., in a letter to Sir Joseph Banks, published in the *Philosophical Transactions* for 1813. It appears that one Seth Wright, the proprietor of a farm on the banks of the Charles River in Massachusetts, possessed a flock of fifteen ewes and a ram of the ordinary kind. In the year 1791, one of the ewes presented her owner with a male lamb differing, for no assignable reason, from its parents by a proportionally long body and short bandy legs, whence it was unable to emulate its relatives in those sportive leaps over the neighbours' fences, in which they were in the habit of indulging, much to the good farmers' vexation.

. . . . . .

"With the 'cuteness' characteristic of their nation, the neighbours of the Massachusetts farmer imagined it would be an excellent thing if all his sheep were imbued with the stay-at-home tendencies enforced by nature upon the newly arrived ram, and they advised Wright to kill the old patriarch of his fold, and install the Ancon ram in his place. The result justified their sagacious anticipations. . . . The young lambs were almost always either pure Ancons or pure ordinary sheep. But when sufficient Ancon sheep were obtained to interbreed with one another it was found that the offspring was always pure Ancon."

"The second case is that detailed by a no less unexceptionable authority than Réaumur, in his *Art de faire éclore les Poulets.* A Maltese couple named Kelleia, whose hands and feet were constructed upon the ordinary human model, had born to them a son, Gratio, who possessed six perfectly moveable fingers on each hand, and six toes, not quite so well formed, on each foot. No cause could be assigned for the appearance of this unusual variety of the human species. But however they may have arisen, what especially interests us is to remark that, once in existence, varieties obey the fundamental law of reproduction, that like tends to produce like, and their offspring exemplify it by tending to exhibit the same deviation from the parental stock as themselves. Indeed, there seems to be in many instances a prepotent influence about a newly arisen variety which gives it what we may call an unfair advantage over the normal descendants from the same stock. This is strikingly exemplified by the case of Gratio Kelleia, who married a woman with the ordinary pentadactyle extremities and

had by her four children, Salvator, George, André, and Marie. Of these children Salvator, the eldest boy, had six fingers and six toes, like his father; the second and third, also boys, had five fingers and five toes, like their mother, though the hands and feet of George were slightly deformed; the last, a girl, had five fingers and five toes, but the thumbs were slightly deformed. The variety thus reproduced itself purely in the eldest, while the normal type reproduced itself purely in the third, and almost purely in the second and last; so that it would seem, at first, as if the normal type were more powerful than the variety. But all these children grew up and intermarried with normal wives and husbands, and then note what took place—Salvator had four children, three of whom exhibited the hexadactyle members of their grandfather and father, while the youngest had the pentadactyle limbs of the mother and grandmother; so that here, notwithstanding a double pentadactyle dilution of the blood the hexadactyle variety had the best of it. The same prepotency of the variety was still more markedly exemplified in the progeny of two of the other children, Marie and George. Marie (whose thumbs only were deformed) gave birth to a boy with six toes, and three other normally formed children; but George, who was not quite so pure a pentadactyle, begot, first, two girls, each of whom had six fingers and toes; then a girl with six fingers on each hand, and six toes on the right foot, but only five toes on the left; and lastly, a boy with only five fingers and toes. In these instances, therefore, the variety, as it were, leaped over one generation to reproduce itself in full force in the next. Finally, the purely pentadactyle André was the father of many children, not one of whom departed from the normal parental type."

169. The instances now quoted illustrate two things. Both tell us how varieties arise, we may say spontaneously, or in other words we cannot tell how; and the former instance, that of the Ancon breed, shows us moreover that such varieties when they do occur may be rendered permanent by means of artificial selection. If the six-fingered descendants of Gratio Kelleia had been forced to intermarry amongst themselves it is highly probable that we should

have had a permanent hexadactyle variety of the human race. It has likewise been shown by Charles Darwin that the pouter, the fan-tail, the carrier, and the tumbler are all varieties of the common rock-pigeon.

170. It thus appears that permanent varieties may be produced by artificial selection. Now Darwin and Wallace have brought before us this great fact that changes can also be produced by natural selection.

To illustrate this, let us imagine that a slight variety arises spontaneously, we do not know how. Having arisen there is a "prepotent influence" about it which enables it to secure a considerable proportion of offspring having its own characteristics. Now, suppose that the characteristics are such as to adapt the individuals possessing them more perfectly to the conditions of nature that surround them. When, by breeding amongst themselves, the new variety is rendered permanent, the members of this variety will, therefore, have an advantage over their elder brethren as far as the conditions of nature are concerned, will in fine succeed better in the struggle for existence, and will ultimately displace the elder branches. In fact the struggle for existence bears to natural selection the same relation as man bears to artificial selection.

171. We now come to the real point of difficulty, or at least the unproved point in the Darwinian hypothesis. We may cross one race with another, but we do not obtain, as far as we know, those phenomena of infertility that are exhibited when we cross distinct species with each other. The Ancon sheep were perfectly fertile when matched with their elder brethren, and the dray-horse and the Arab, or the pouter and the tumbler, breed together as easily as if they were of the same race. But if we cannot produce infertility how

can we apply the results of artificial selection to account for the origin of species?

This difficulty is met by Darwin and his followers in this way :—"It is not as yet proved," says Professor Huxley, "that a race ever exhibits, when crossed with another race of the same species, those phenomena of hybridisation which are exhibited by many species when crossed with other species. On the other hand, not only is it not proved that all species give rise to hybrids infertile *inter se*, but there is much reason to believe that, in crossing, species exhibit every gradation from perfect sterility to perfect fertility." This appears to carry weight; the old theory went with a leap from perfect fertility to perfect sterility, and did not contemplate the possibility of a continuous gradation from the one extreme to the other; at least its argument was founded upon the neglect of such a gradation. But if there be a gradation of this kind, it follows that infertility will merely represent the results of crossing two species whose functional characteristics are very different from each other; and, on the other hand, the reason why artificially produced varieties are not infertile when crossed with one another may only be that the experiment has not been continued long enough.

Time, in fact, is the essential requisite in all such attempts to imitate nature.

172. In connection with this subject, Mr. Darwin has remarked that certain plants are more fertile with the pollen of another species than with their own; and Professor Huxley tells us that there are certain *fuci* whose male element will fertilise the ovule of a plant of distinct species, while the males of the latter species are ineffective with the females of the first. So obscure in some of its branches is the working of the reproductive system.

Again, the following remark by Mr. Darwin is very suggestive :—

"First crosses between forms known to be varieties, or sufficiently alike to be considered as varieties, and their mongrel offspring, are very generally, but not quite universally, fertile. Nor is this nearly general and perfect fertility surprising, when we remember how liable we are to argue in a circle with respect to varieties in a state of nature ; and when we remember that the greater number of varieties have been produced under domestication, by the selection of mere external differences, and not of differences in the reproductive system. In all other respects, excluding fertility, there is a close general resemblance between hybrids and mongrels."

173. The result of all these speculations is to render it probable that there may be in nature, give it time enough, a process which leads to the transmutation of species.

The accumulation of successive differences, each representing some element of success in the struggle for life, may easily be imagined in the course of ages to produce a very great change.

Reasoning out this hypothesis, the more advanced followers of Mr. Darwin do not hesitate to ascribe all the varieties of living things, including man, to the result of development from some primordial germ taking place throughout the course of immeasurable ages. And Mr. Darwin himself, in his work on the Descent of Man, lays great stress on the occurrence of homologous structures in man and the lower animals, as well as on the development in man of rudimentary structures, which are either absolutely useless to their possessors, or of very slight service indeed, but which appear to serve as an index of the

various stages through which the human species has passed in its progress upwards from lower forms of life.

174. Mr. Wallace, however, sees in the production of man the intervention of an external will.

He remarks that the lowest types of savages are in possession of a brain, and of capacities far beyond any use to which they could apply them in their present condition, and that therefore they could not have been evolved from the mere necessities of their environments.

175. Finally, Professor Huxley imagines the possibility of the Darwinian hypothesis requiring modification. Alluding to the assumed circularity of the planetary orbits that followed the establishment of the Copernican hypothesis (Art. 69), he remarks :—

"But the planetary orbits turned out to be not quite circular after all, and, grand as was the service Copernicus rendered to science, Kepler and Newton had to come after him. What if the orbit of Darwinism should be a little too circular? What if species should offer residual phenomena, here and there, not explicable by natural selection? Twenty years hence naturalists may be in a position to say whether this is, or is not, the case; but in either event they will owe the author of 'The Origin of Species' an immense debt of gratitude."

176. We will defer to our last chapter any further remarks on Mr. Darwin's hypothesis. Meanwhile, before concluding, let us briefly allude to the original production of living things on our globe. It may, perhaps, eventually be possible by means of an hypothesis of evolution, to account for the great variety of living forms on the supposition of a single primordial germ to begin with; but the difficulty still remains how to account for this germ.

It is against all true scientific experience that life can appear without the intervention of a living antecedent. How then are we to explain the production of the primordial germ ?

The difficulty of doing so, from our point of view, would appear to be unusually great, for we have come to the conclusion that, as a matter of scientific principle, we cannot admit any such breach of continuity as a pure act of creation in time would imply.

If, then, a pure act of creation in time be an inadmissible hypothesis, and if the hypothesis of Abiogenesis be equally inadmissible, our readers may well ask how are we to surmount the difficulty. For our reply to this question, we must once more beg to refer them to our concluding chapter.

CHAPTER VI.

SPECULATIONS AS TO THE POSSIBILITY OF SUPERIOR INTELLIGENCES IN THE VISIBLE UNIVERSE.

"The earth hath bubbles, as the water has,
And these are of them."—SHAKESPEARE, *Macbeth.*

177. OUR readers are now aware from what we have said in Chapter II. that the two great requisites for organised existence are, in the first place, an organ of memory, giving the individual a hold upon the past, and secondly, the possibility of varied action in the present, and that unless these two things are fulfilled life is simply inconceivable.

Again, in Chapters III., IV., and V. we have sufficiently discussed the visible universe and its potentialities. We have seen that although at present it contains the essential requisites for organised existence, yet, in the remote future, a time will necessarily arrive when, through a degradation of the Energy of this universe, that variety of motion which is essential to our conception of life will be unattainable. Immortality is, therefore, impossible in such a universe; but even allowing all this to be the case, it is at least conceivable that man may be at death drafted off into some superior rank of being connected with the present universe, and thence ultimately removed into a new order of things when the present universe shall have become effete.

Let us now, therefore, very briefly discuss the question as to the possibility of intelligences superior to man existing

in the present visible universe. And, in order to commence this inquiry, let us analyse with some minuteness the physical source of that peculiarity which the present universe possesses, in virtue of which it affords living beings the means of a varied existence. Whence is all this power derived? How comes it about that a living being possesses that abruptness and spontaneity of action which peculiarly characterise it? In fine, let us consider the exact position of life in the present physical universe.

178. Now, in the first place, it is well known that equilibrium may be of two kinds, stable and unstable, and if we take an egg balanced on its end at the edge of a table as the example of mechanical instability, as a recent writer has done,[1] we shall no doubt agree with him that it "depends upon some external impulse so infinitesimally small as to elude our observation whether the egg shall fall upon the floor and give rise to a comparatively large transmutation of energy, or whether it shall fall upon the table and give rise to a transmutation comparatively small."

But, just as there are other forces besides gravity, so there are other varieties of instability besides that which we treat of in mechanics.

We may, for instance, have molecular instability, such as characterises water cooled below the freezing point, or a supersaturated solution of Glauber's salt, where the advent of the smallest possible crystal of ice or of Glauber's salt is sufficient to bring about a marked molecular change in the liquid, which immediately becomes thick with deposited crystals; or again, we may have chemical instability in which the slightest impulse of any kind may determine a chemical change, just as in mechanical instability the

[1] See Stewart on the *Conservation of Energy.*

slightest possible impulse may determine a mechanical change. Thus fulminating silver or nitro-glycerine are familiar examples of chemical instability in which the slightest blow or the smallest spark may be sufficient to bring about an instantaneous and violent generation of heated gas.

179. Again, all machines—that is to say, all material systems—must necessarily be of two kinds, one of which makes use of the stable forces of nature and the other of the unstable. The following quotation from Stewart's work on Energy will sufficiently explain what is meant:—

"When we speak of a structure, or a machine, or a system, we simply mean a number of individual particles associated together in producing some definite result. Thus, the solar system, a timepiece, a rifle, are examples of inanimate machines; while an animal, a human being, an army, are examples of animated structures or machines. Now, such machines or structures are of two kinds, which differ from one another not only in the object sought, but also in the means of attaining that object.

"In the first place, we have structures or machines in which systematic action is the object aimed at, and in which all the arrangements are of a conservative nature, the element of instability being avoided as much as possible. The solar system, a timepiece, a steam-engine at work, are examples of such machines, and the characteristic of all such is their *calculability*. Thus the skilled astronomer can tell, with the utmost precision, in what place the moon or the planet Venus will be found this time next year. Or again, the excellence of a timepiece consists in its various hands pointing accurately in a certain direction after a certain interval of time. In like manner we may safely count upon a steamship making so many knots an hour, at least while the outward conditions remain the same. In all these cases we make our calculations, and we are not deceived—the end sought is regularity of action, and the means employed is a stable arrangement of the forces of nature.

"Now, the characteristics of the other class of machines are precisely the reverse.

"Here the object aimed at is not a regular, but a sudden and violent, transmutation of energy, while the means employed are unstable arrangements of natural forces. A rifle at full cock, with a delicate hair-trigger, is a very good instance of such a machine, where the slightest touch from without may bring about the explosion of the gunpowder, and the propulsion of the ball with a very great velocity. Now, such machines are eminently characterised by their *incalculability.*

"It is thus apparent that, as regards energy, structures are of two kinds. In one of these, the object sought is regularity of action, and the means employed, a stable arrangement of natural forces; while in the other, the end sought is freedom of action, and a sudden transmutation of energy, the means employed being an unstable arrangement of natural forces.

"The one set of machines are characterised by their calculability—the other by their incalculability. The one set, when at work, are not easily put wrong, while the other set are characterised by great delicacy of construction."

180. Having thus defined the two kinds of machines, let us now see to what extent a living being may be regarded as a machine, and also to which of these two categories he belongs.

In all machines what we do is merely to transform energy. Our readers are well aware, by what we have already said (Art. 102), that it is just as impossible to create energy as it is to create matter.

Thus a clock has to be wound up before it will go; an engine has to be stoked with coal; a rifle or cannon has to be charged with powder; and in fine, all machines, whether delicately constructed or not, whether calculable or incalculable, are merely transmuters of energy and not creators of it.

To this law the living being is no exception. The creatures of this world (and it is of such we are now speaking) are certainly not creators of energy; but in respect of the

great law of the conservation of energy, such beings must be regarded in the very same light as any other machines.

But there is yet another analogy between living beings and inanimate machines. When we study the working of any machine, we find that each transmutation of energy brought about has a material antecedent; the effect produced has a cause from which it springs, and this cause is one which we are probably able to recognise from our knowledge of the laws of matter. To take an example: in a steam-engine the amount of work produced depends upon the amount of heat carried from the boiler to the condenser; and the latter depends in its turn upon the amount of coal which is burned in the furnace of the engine. In like manner, the velocity of the bullet which issues from a rifle depends upon the transmutation of the energy of the powder; this in its turn depends upon the explosion of the percussion cap; this again upon the fall of the trigger; and lastly this upon the finger of the man who fires the rifle.

Now, without attempting to define what life is, and leaving all speculations regarding it to our last chapter, we yet think it may safely be said that a living being is analogous to a machine in this particular also.

Let us take the man who fires the rifle. We can trace back the motion of his forefinger to the contraction of a muscle; and we can go even further back and connect this contraction with a stimulus sent along the nerves from the brain, so that a material effect is here seen to be brought about by a material antecedent, just as truly as in an inanimate machine. Indeed, we may generalise, and say that, *as far as we can physically investigate a living*

being, we may take it for granted that a material effect is due to a strictly material antecedent in his case also.

181. We have thus discussed two respects in which a living being is analogous to a machine, and the next point is to determine which of the two classes of machines most resembles the living being. Is he analogous to the solar system, a steam-engine, or a clock? or is he rather analogous to some delicately constructed machine, such, for instance, as a rifle? There can, we think, be no doubt that a living being most resembles a delicately constructed machine. For what is the characteristic of such a machine? It is that in it a comparatively great transmutation of energy may be brought about by a comparatively small physical antecedent. Thus a slight breath of air may determine the fall of the egg off the table, or a slight tap the explosion of a large quantity of fulminating silver. So in the human being, a very small and obscure transmutation of energy in the mysterious brain-chamber may determine some very violent motion. Speaking of this subject, Stewart remarks :—"Life is not a bully who swaggers out into the open universe, upsetting the laws of energy in all directions, but rather a consummate strategist, who, sitting in his secret chamber over his wires, directs the movements of a great army."

182. Granting then that a living being is a delicately constructed machine, the next point is to determine what process of delicacy, what peculiar arrangement of unstable forces is employed in his construction? Now it is very easy to perceive that the delicacy in this case is brought about by an unstable arrangement of chemical forces. It is plain that the body of an animal is a chemically unstable product, and if, as one consequence of this, great freedom

of action and delicacy are possessed during life, it is another consequence that the extinction of life is very speedily followed by decay.

The body then owes its delicacy to its chemically unstable nature ; to that peculiar collocation of particles that would not naturally, and in virtue of their own forces, have united themselves together as we find them in the body.

183. To what, then, is due this peculiar grouping of particles in the living body ?

We reply that it is, in one sense at least, derived from the food which is eaten. If animal food is eaten, it is of course derived from the body of the animal which is consumed. That animal may possibly have derived it from another animal, but more probably it has been derived in this case direct from the vegetable world. Ultimately, therefore, it is to this world that we must look as the source of that delicately constructed substance which plays such a wonderful and important part in the animal economy. If we go one link further back in the chain of causation, we shall be carried from the vegetable world to the sun as the great and ultimate physical source of that high-class energy and delicacy of construction which characterise vegetable products. It is, in truth, owing to the actinic rays of our luminary that vegetable tissue is manufactured in the leaves of plants, the carbonic acid of the air being decomposed, and oxygen given out, while the carbon, united with other substances, and modified thereby, is retained by the plant to form part of its substance, or perchance to become the food of animals.

184. We have now therefore arrived at the conclusion that the delicacy of construction which our frames require is ultimately derived from the sun, as far at least as the visible universe is concerned. If then we would reply to the

question of this chapter, whether or not there may be beings superior to man connected with this present universe, let us look abroad and endeavour to ascertain whether there be in this universe any other obvious process of delicacy besides that which characterises the bodies of animals like ourselves.

Now, it has been pointed out that, in the atmospheric changes of this world, and more particularly of the sun, we have processes of great delicacy. It is believed that the positions of the planets, Mercury and Venus, affect the behaviour of sun-spots, and thus determine the conditions of atmospheric changes on the surface of our luminary that are absolutely overwhelming in their magnitude. We have only to reflect that a large sun-spot might swallow up fifty planets like our earth, and that some of the currents connected with it move at the rate of 100 miles per second, in order to realise the enormous scale of these solar outbreaks. Again, it is believed that the state of the solar surface with regard to spots determines the storms of our earth, so that there are most hurricanes in the Indian Ocean as well as on the coast of America during years of maximum sun-spots.

But if such results are brought about by the relative positions of the planets of our system, it is evident that the cause is more analogous to the pulling of the trigger of a cannon ready to go off than to a downright blow. In fact, a vast transmutation of energy in the sun is brought about by some obscure and ill-understood but trivial cause connected with the position of the nearer planets of our system. We have here a case where the magnitude of the effect is out of all proportion to that of the antecedent; now this is, in other words, the definition of delicacy already given (Art. 179).

But, again, if delicacy of construction characterise the meteorological changes in the various members of our system, it is entirely absent from the orbital motions of these bodies. These want that great characteristic of delicacy, *incalculability;* for they are not only pre-eminently calculable, but are now calculated years beforehand as part of the regular business of the world. On the other hand, the meteorological changes of our earth and of the sun come upon us with all the abruptness characteristic of delicacy, and are eminently incalculable. The hurricane and the lightning flash are processes of Nature which man has in every age been prone to associate with personal intelligences. He has instinctively recognised the similarity between these abrupt and startling phenomena and the actions of an angry and powerful being.

185. It may no doubt be long since there has been anything like an extensive worship of the powers of nature amongst the civilised nations of the earth, but there may yet be found even at the present day, especially amongst imaginative races, and in wild and mountainous regions, a lingering belief that personal agents are concerned in the more startling natural phenomena.

Such a belief was extensively prevalent during the middle ages, and whole volumes might easily be filled with an account of mediæval superstitions and legends relating to this subject, sometimes dark and terrible, and at other times possessing a peculiar and pathetic beauty which does not belong to anything else. The air, the earth, and the water have all been peopled with spirits; some of them friendly to man, some of them his deadly enemies. They are powerful, and conscious of their power, but at the same time profoundly and mournfully aware that they are with-

out a soul. Their life depends, it may be, upon the continuance of some natural object, and hence for them there is no immortality. Sometimes, however, an elemental spirit procures a soul by means of a loving union with one of the human race, and the beautiful romance of Undine is built upon this fancy.

At other times the reverse happens, and the soul of the mortal is lost who, leaving the haunts of men, associates with these soulless but often amiable and affectionate beings. "The Forsaken Merman," by Matthew Arnold, expresses this fancy in a very beautiful and touching manner:—

> "Children dear, was it yesterday
> (Call once more) that she went away?
> Once she sate with you and me
> On a red gold throne in the heart of the sea,
> And the youngest sate on her knee.
> She comb'd its bright hair, and she tended it well,
> When down swung the sound of the far-off bell.
> She sigh'd, she look'd up through the clear green sea;
> She said, 'I must go, for my kinsfolk pray
> In the little grey church on the shore to-day.
> 'Twill be Easter time in the world—ah me!
> And I lose my poor soul, Merman, here with thee.'
> I said, 'Go up, dear heart, through the waves;
> Say thy prayers and come back to the kind sea-caves.'
> She smiled, she went up through the surf in the bay.
> Children dear, was it yesterday?"

186. A conception, in some respects analogous to that now mentioned, but in other respects very different from it, is that which attributes a soul to the universe; and it has even been imagined that the whole visible universe forms, as it were, one gigantic brain.

Others again appear inclined to believe that there may be many cosmical intelligences, each embracing the whole universe, and therefore interpenetrating one another, and at

the same time taking part in its government by means of such processes of delicacy as those we have mentioned.

187. Now, before proceeding further in the discussion of these speculations, let us here state more definitely than we have yet done what is the real point in question.

It is not so much the possibility of the delicate processes of nature being directed by an intelligent agency; this is in reality a different question, and one which will be discussed in our concluding chapter. But the question now before us is, whether any such agency may be said to belong to the present visible universe?

To make our meaning clear: we know that we ourselves belong to the present visible universe. Again, there are many of us who believe that angelic intelligences are the ministers of God's providence. Now, whether this doctrine be true or not (and we are not now concerned about its truth), it is evident that such intelligences cannot be said to belong to the present physical universe. The organisation which they possess, and without which (Art. 61) we cannot imagine a finite intelligence to exist, is most assuredly nothing that can be perceived by our bodily senses, nor can we imagine that their existence is at all dependent on the fate of the visible universe; in fine, they do not belong to it.

Our present question, therefore, is whether we can associate the delicate cosmical processes of the visible universe with the operations of intelligences residing in this universe and belonging to it, and to this question we must assuredly give a negative reply.

188. We entertain no doubt that man and beings at least analogous to man represent the highest order of living things connected with the present visible universe.

For, in the first place, although there is abundant evidence of delicacy of construction in the cosmical processes of this universe, there is no evidence of an organisation such as that which observation leads us to associate with the presence of life.

In the next place, whatever view we may entertain of the Darwinian hypothesis and the relation of man to the lower animals, there can be no doubt that they are all of a similar physical construction. What physiologists term the matter of life is very much the same in all, so that the body of any one animal may afford food for any other. Now, is it likely that there are two living systems, absolutely distinct and as different from one another as we can well imagine, both connected with the visible universe ?

We think this view would imply such a want of unity in the plan of development as to be absolutely fatal to its reception, even as a working hypothesis. On these accounts, therefore, we do not hesitate to dismiss the conception of a superior order of beings connected with the present physical universe as one which is altogether untenable.

189. If we now turn from the verdict of science to the sacred writings of the Jews, we find that one grand idea which pervades the whole of the Old Testament is man's absolute superiority and practical sovereignty over all created beings whom he can perceive otherwise than with the *mind's eye.*

He is supreme, or it is part of his work on earth to become supreme, over all that can be perceived by his senses, *i.e.* all the visible and tangible world. Thus we read in Gen. i. 28 : " And God blessed them : and God said unto them, Be fruitful, and multiply, and replenish the earth,

and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth."

Again, we read (Psalm viii. 5, 6): "For thou hast made him a little lower than the angels, and hast crowned him with glory and honour. Thou madest him to have dominion over the works of thy hands; thou hast put all things under his feet." [It appears that the correct reading of the first part of this is, "Thou hast made him little less than divine," etc.]

190. It is worthy of note that the same idea is still more fully developed in the New Testament, where it is confessed that, in one very important respect, this superiority of man is seen to fail.

He has greatly enlarged his powers over nature, and has by these means much ameliorated the condition of his race; yet death overtakes him just as remorselessly and as ruthlessly as if he were a savage of no account. He may meet death fearlessly, conscious that he has at least done something for the good of his fellows. But what does it all amount to? Death will ultimately overtake the race just as remorselessly as the individual. Now it is this fearful enemy, this terrible exception to the domination of man, that Christ, as the Son and type of man, is commissioned to destroy. Thus we read (1 Cor. xv. 25): "For he must reign, till he hath put all enemies under his feet. The last enemy that shall be destroyed is death. For he hath put all things under his feet." And presently (verse 54) the apostle breaks forth into the following triumphant and beautiful language:—"So when this corruptible shall have put on incorruption, and this mortal shall have put on immortality, then shall be brought to pass the saying that

is written, Death is swallowed up in victory." Again we read (Heb. ii. 8): "For in that he put all in subjection under him, he left nothing that is not put under him. But now we see not yet all things put under him: but we see Jesus, who was made a little lower than the angels for the suffering of death, crowned with glory and honour; that he by the grace of God should taste death for every man. For it became him, for whom are all things, and by whom are all things, in bringing many sons unto glory, to make the Captain of their salvation perfect through sufferings." [Here again it appears that instead of the phrase "made a little lower than the angels," we should read, "made for a little time lower than the angels"—*i.e.* an idea identical in meaning with the phrase "made under the law," the Old Testament law being viewed as administered by angels. From this dispensation, in which cosmical powers come between man and God, Christ frees us, by himself for a little time entering into it, and even under it meeting death.]

191. From all this we may conclude that both science and religion tell us the same tale. They inform us that man, and beings similar to man, are at the head of the visible universe. No doubt religion informs us, in addition to this, that there are other beings above man, but these do not live in the visible universe, but in that which is unseen and eternal.

CHAPTER VII.

THE UNSEEN UNIVERSE.

"Rabbi Jacob said, 'This world is as it were the anteroom of the world to come. Prepare thyself in the anteroom so that thou mayest be fit to enter the banquet room.'"—*Mishna, Pirke Aboth*, chap. iv. par. 16.

"For I reckon, that the sufferings of this present time are not worthy to be compared with the glory which shall be revealed in us. For the earnest expectation of the creature waiteth for the manifestation of the sons of God."—St. Paul (Rom. viii. 18, 19).

"Eternal process moving on
From state to state the spirit walks,
And these are but the shatter'd stalks,
Or ruin'd chrysalis of one."—Tennyson.

192. In the preceding chapters we have examined by the light of our present knowledge the possibilities contained in the visible universe. What is it good for in the way of immortality is the question we have tried to answer. It will have been seen that the reply is eminently unfavourable. If we take the individual man to begin with, we find that he lives his short tale of years, and that then the visible machinery which connects him with the past, as well as that which enables him to act in the present, falls into ruin and is brought to an end. If any germ or potentiality remains, it is certainly not connected with the visible order of things.

If we next consider the human race we shall find that the state of advancement to which they have attained is

greatly due to their physical surroundings. Coal and iron have been as instrumental in promoting knowledge as Galileo and Newton, but both of these materials will come to an end. By economy it may be possible to lengthen out our present supplies, but is it not manifest that we are year by year exhausting them as sources of available energy?

Are we not inevitably led to conclude that our present state cannot last even for a lengthened period, but will be brought to an end long before the inevitable dissipation of energy shall have rendered our earth unfit for habitation?

193. But even supposing that man, in some form, is permitted to remain on the earth for a long series of years, we merely lengthen out the period, but we cannot escape the final catastrophe. The earth will gradually lose its energy of rotation, as well as that of revolution round the sun. The sun himself will wax dim and become useless as a source of energy, until at last the favourable condition of the present solar system will have quite disappeared.

But what happens to our system will happen likewise to the whole visible universe (Art. 116), which will inevitably become a lifeless mass, if indeed it be not doomed to utter dissolution. In fine, it will become old and effete, no less truly than the individual—it is a glorious garment this visible universe, but not an immortal one—we must look elsewhere if we are to be clothed with immortality as with a garment.

194. Now, if we regard the dissipation of energy which is constantly going on, we are at first sight forcibly struck with the apparently wasteful character of the arrangements of the visible universe. All but a very small portion of the sun's heat goes day by day into what we call empty space, and it is only this very small remainder that is made use of by

the various planets for purposes of their own. Can anything be more perplexing than this seemingly frightful expenditure of the very life and essence of the system? That this vast store of high-class energy should be doing nothing but travelling outwards in space at the rate of 188,000 miles per second is hardly conceivable, especially when the result of it is the inevitable destruction of the visible universe.

195. If, however, we continue to dwell upon this astounding phenomenon, we begin to perceive that perhaps it may only be an arrangement in virtue of which our universe keeps up a memory of the past at the expense of the present; for, indeed, all memory (Art. 59) consists in an investiture of present resources in order to keep a hold upon the past. We have seen (Art. 149) that this medium—this ether—has the power of transmitting motion from one part of the universe to another. A picture of the sun may be said to be travelling through space with an inconceivable velocity, and, in fact, continual photographs of all occurrences are thus produced and retained. A large portion of the energy of the universe may thus be said to be invested in such pictures. But we may go even further than luminiferous vibrations and the surfaces of bodies, since the law of gravitation assures us that any displacement which takes place in the very heart of the earth will be felt throughout the universe, and we may even imagine that the same thing will hold true of those molecular motions (Art. 56) which accompany thought. For every thought that we think is accompanied by a displacement and motion of the particles of the brain, and somehow—in all probability by means of the medium—we may imagine that these motions are propagated throughout the universe. Views of this nature

were long ago entertained by Babbage, and they have since commended themselves to several men of science, and amongst others to Jevons. "Mr. Babbage," says this author,[1] "has pointed out[2] that if we had power to follow and detect the minutest effects of any disturbance, each particle of existing matter must be a register of all that has happened."

196. We ourselves believe that the explanation of nature's apparent prodigality is to be sought for in such a mode of viewing things, but the thought requires to be carried even further than this. For, after all, it may be said, What is the use of this enormous sacrifice of present energy in order to keep up a communication with the past? If this visible universe were intended to last for ever and to afford an eternal existence to intelligent beings, the theory would be conceivable, for the opportunity of realising the past of the universe would be an endless source of gratification to such beings. But, far from lasting for ever, the visible universe dies from the very efforts which it constantly puts forward in this direction. How then can it be said that this effort is made in behalf of intelligent beings when the consequence of the effort is the destruction of life? We must evidently go further than this.

197. Here let us remind our readers of the argument (Art. 84) by which we were led to conclude that the visible system is not the whole universe, but only, it may be, a very small part of it; and that there must be an invisible order of things, which will remain and possess energy when the present system has passed away. Furthermore, we have seen that an argument derived from the beginning rather than the end of things (Art. 85) assures us that the invisible

[1] *Principles of Science*, vol. ii. p. 455.
[2] So-called Ninth Bridgewater Treatise.

universe existed before the visible one. From this we conclude that the invisible universe exists now, and this conclusion will be strengthened when (Art. 215) we come to discuss the nature of the invisible universe, and to see that it cannot possibly have been changed into the present, but must exist independently now. It is, moreover, very closely connected with the present system, inasmuch as this may be looked upon as having come into being through its means (Art. 215).

Thus we are led to believe that there exists now an invisible order of things intimately connected with the present, and capable of acting energetically upon it—for, in truth, the energy of the present system is to be looked upon as originally derived from the invisible universe.

198. Now, is it not natural to imagine that a universe of this nature, which we have reason to think exists, and is connected by bonds of energy with the visible universe, is also capable of receiving energy from it? Whether is it more likely that by far the larger portion of the high-class energy of the present universe is travelling outwards into space with an immense velocity, or that it is gradually transferred into an invisible order of things? May we not regard ether or the medium as not merely a bridge between one portion of the visible universe and another, but also as a bridge between one order of things and another, forming as it were a species of cement, in virtue of which the various orders of the universe are welded together and made into one? In fine, what we generally call ether may be not a mere medium, but a medium *plus* the invisible order of things, so that when the motions of the visible universe are transferred into ether, part of them are conveyed as by a bridge into the invisible universe, and are there made use

of or stored up. Nay, is it even necessary to retain the conception of a bridge? May we not at once say that when energy is carried from matter into ether it is carried from the visible into the invisible; and that when it is carried from ether to matter it is carried from the invisible into the visible?

199. If we now turn to thought, we find (Art. 59) that, inasmuch as it affects the substance of the present visible universe, it produces a material organ of memory. But the motions which accompany thought will also affect the invisible order of things, and thus it follows, that "*Thought conceived to affect the matter of another universe simultaneously with this may explain a future state*" (see Anagram, *Nature*, October 15, 1874).

200. This idea, however, requires further development and explanation. Let us therefore begin by supposing that we possess a frame, or the rudiments of a frame, connecting us with the invisible universe, which we may call the spiritual body.

Now each thought that we think, is accompanied by certain molecular motions and displacements in the brain, and part of these, let us allow, are in some way stored up in that organ, so as to produce what may be termed our material or physical memory. Other parts of these motions are, however, communicated to the spiritual or invisible body, and are there stored up, forming a memory which may be made use of when that body is free to exercise its functions.

201. Again, one of the arguments (Art. 84) which proves the existence of the invisible universe demands that it shall be full of energy when the present universe is defunct. We can therefore very well imagine that after death, when the

spiritual body is free to exercise its functions, it may be replete with energy, and have eminently the power of action in the present, retaining also, as we have shown above, a hold upon the past, inasmuch as the memory of past events has been stored up in it, and thus preserving the two essential requisites (Art. 61) of a continuous intelligent existence.

202. The conception of an unseen universe is not a new one, even among men of science. The deservedly famous Dr. Thomas Young has the following passage in his lectures on Natural Philosophy:—"Besides this porosity, there is still room for the supposition, that even the ultimate particles of matter may be permeable to the causes of attractions of various kinds, especially if those causes are immaterial: nor is there anything in the unprejudiced study of physical philosophy that can induce us to doubt the existence of immaterial substances; on the contrary, we see analogies that lead us almost directly to such an opinion. The electrical fluid is supposed to be essentially different from common matter; the general medium of light and heat, according to some, or the principle of caloric, according to others, is equally distinct from it. We see forms of matter, differing in subtility and mobility, under the names of solids, liquids, and gases; above these are the semi-material existences, which produce the phenomena of electricity and magnetism, and either caloric or a universal ether. Higher still, perhaps, are the causes of gravitation, and the immediate agents in attractions of all kinds, which exhibit some phenomena apparently still more remote from all that is compatible with material bodies. And of these different orders of beings, the more refined and immaterial appear to pervade freely the grosser. It

seems therefore natural to believe that the analogy may be continued still further, until it rises into existences absolutely immaterial and spiritual. We know not but that thousands of spiritual worlds may exist unseen for ever by human eyes; nor have we any reason to suppose that even the presence of matter, in a given spot, necessarily excludes these existences from it. Those who maintain that nature always teems with life, wherever living beings can be placed, may therefore speculate with freedom on the possibility of independent worlds; some existing in different parts of space, others pervading each other unseen and unknown, in the same space, and others again to which space may not be a necessary mode of existence."

203. The only remark that we would make upon this most beautiful and comprehensive passage, with the spirit of which we entirely agree, is, that the author does not use the words *material* and *immaterial* precisely in our sense of these terms. He is inclined to imagine the possibility of an immaterial existence being yet trammelled with regard to space; whereas to our mind such trammels (Art. 54) necessarily constitute matter. If we substitute for *matter* the words *gross matter*, and for *immaterial* the words *not grossly material*, we shall be very nearly at one.

204. It may now be desirable to reply by anticipation to certain objections which are likely to be made to the theory we have proposed. Let us divide these into three categories—religious, theological, and scientific.

Objection First (*Religious*).—It may be said to us, "Who are you who are wise beyond what is written? Are ye of them to whom it was said of old, 'Eritis sicut Deus scientes bonum et malum'? Beware of the words of the

great Apostle of the Gentiles :—*Φάσκοντες εἶναι σοφοὶ, ἐμωράνθησαν.*"

Reply.—As we have already said (Art. 50), we do not write for those who are so assured of the truth of their religion that they are unable to entertain the smallest objection to it. We write for honest inquirers—for honest doubters, it may be, who desire to know what science, when allowed perfect liberty of thought and loyally followed, has to say upon those points which so much concern us all. We are content to view the universe from the physical standpoint; you may therefore perchance esteem us of the earth earthy; nevertheless we think that our strength lies in keeping up a communication with those verities which we all acknowledge.

205. *Objection Second* (*Theological*).—Your idea of the spiritual universe is analogous to that of Swedenborg, and we must therefore dismiss it as untrue, inasmuch as we can only recognise the assumption of the spiritual body after the resurrection.

Reply.—All that we have done is to remove the scientific objection to a future state, supposed to be furnished by the principle of Continuity. We know nothing about the laws of this state, and conceive it quite possible, if otherwise likely, that the spiritual body may remain veiled or in abeyance until the resurrection. We only maintain that we are logically constrained to admit the existence of some frame or organ not of this earth, which survives dissolution —if we regard the principle of continuity and the doctrine of immortality as both true.

206. *Objection Third* (*Theological*).—Your argument will apply to the brute creation as well as to man; now we cannot recognise the immortality of the brutes.

Reply.—As before stated, we know nothing about the laws of the invisible universe, except that it is related by bonds, probably of energy, to the present. All we have attempted has been to remove an objection to the doctrine of immortality which has been wrongly put forth as scientific, or at least as consistent with scientific knowledge.

207. *Objection Fourth* (*Scientific*).—If there be, as you say, this duality in the present human frame, how can the spiritual part remain latent so long as it does? Even if trammelled by the grosser substance, we might expect that at least on rare occasions it should somehow manifest itself.

Reply.—As a matter of fact we know that ordinary consciousness can remain latent or inactive for hours, if not for days, and then return to us again. There would be force in this objection if it were not true that consciousness is capable of entering into the dormant or quiescent state.

Again, it is possible that there have been and that there are occasional manifestations of this spiritual nature.

For, in the Christian records visible manifestations of the spiritual element, even in this life, are asserted to have taken place on rare occasions. But if you have dismissed these manifestations as inconceivable, you cannot now bring their absence forward as an objection.

208. *Objection Fifth* (*Scientific*).—Your doctrine of immortality does violence to that great principle, the conservation of energy. For it is manifest that if energy is transferred from the visible into the invisible universe, its constancy in the present universe can no longer be maintained.

Reply.—In reply to this objection we assert the conservation of energy as a principle applicable to the whole universe, and not to one portion of it, except under special limitations. It is only by assuming the continual passage

through ether of a large portion of the energy of the visible universe that the doctrine as at present held can be maintained Now the only addition that our theory demands is the gradual absorption of some part at least of this energy into the invisible universe ; and we have said (Art. 147) that it has been supposed that there is evidence of an absorption of this nature. It may safely be said that our hypothesis is not upset, and never can be upset, by any experimental conclusion with regard to energy.

209. *Objection Sixth* (*Scientific*).—We cannot understand how individuality is to be preserved in the spiritual world.

Reply.—This is no new difficulty. We are as much puzzled by what takes place in our present body as we can be with respect to the spiritual. Thus, let us allow that impressions are stored up in our brains, which thus form an organ connecting us with the past of the visible universe. Now thousands, perhaps even millions, of such impressions pass into the same organ, and yet, by the operation of our will, we can concentrate our recollection upon a certain event, and rummage out its details, along with all its collateral circumstances, to the exclusion of everything else. But if the brain or something else plays such a wonderful part in the present economy, is it impossible to imagine that the universe of the future may have even greater individualising powers ? Is it not very hazardous to assert this or that mode of existence to be impossible in such a wonderful whole as we feel sure the universe must be ?

210. *Objection Seventh* (*Scientific*).—Even if it be allowed that the invisible universe receives energy from the present, so that the conservation of energy holds true as a principle, yet the dissipation of energy must hold true also, and although the process of decay may be delayed by the

storing up of energy in the invisible universe, it cannot be permanently arrested. Ultimately we must believe that every part of the whole universe will be equally supplied with energy, and in consequence all abrupt living motion will come to an end.

Reply.—Perhaps the best reply to this objection is, to regard the universe as an infinite whole—a thought which will be developed in what follows of this book. For it is clear that if the universe be infinite, and contain within itself an infinite supply of energy, we may imagine it to go on from eternity to eternity without the possibility of becoming effete. Besides, what is to prove dissipation in the universe of the future? We have seen (Art. 112) how Clerk-Maxwell's demons (though essentially finite intelligences) could be made to restore energy in the present universe without spending work. Much more may be expected in a universe free from gross matter.

211. Having replied to these objections, let us now endeavour to realise our present position. It is briefly as follows:—What we have done is to show that immortality is possible, and to demolish any so-called scientific objection that might be raised against it. The evidence in favour of the doctrine is not derived from us. It comes to us from two sources: in the first place, from the statements made concerning Christ; and, in the second place, from that intense longing for immortality which civilised man has invariably possessed. The case stands thus: certain evidence from these two sources in favour of our doctrine has been adduced, but scientific objections have been raised against the possibility of the doctrine itself, and these we have attempted to overcome. But while we may suppose the objections to the doctrine itself surmounted,

there yet remains an equally strong scientific objection to that portion of the evidence in favour of the doctrine which is derived from the Christian records. Granting, it may be said to us, that immortality is possible, what reason have we, beyond certain vague yearnings, for believing it likely? No doubt, if Christ rose from the dead, the probability in favour of it would be very strong; but we have an objection to the resurrection of Christ no less formidable than that which you have overcome with regard to the doctrine itself.

212. It will now be our duty to examine the validity of this objection, and in so doing we must approach the problem of the universe not from the side of the future but from that of the past.

We have already (Art. 85) defined the principle of Continuity, in virtue of which we believe ourselves entitled to discuss every event that occurs in the universe, without one single exception, and to deduce from it, if we can, the condition of things that preceded the event—this being also in the universe. Now, we learn by means of that great physical principle, the dissipation of energy, that the visible universe cannot have lasted for ever, but must have made its appearance in time; and applying to this stupendous event, not irreverently, but in hopeful trust, the principle of Continuity, we ask ourselves the question, What state of things, also in the universe, what conceivable antecedent can have given rise to this unparalleled phenomenon—an antecedent, we need hardly say, that must have operated from the invisible universe? It is a great and awful phenomenon, but we must not shrink before size; we must not be terrified by the magnitude of the event out of reliance upon our principles of discussion.

Now, if we regard the appearance of the visible universe and approach it as we would any other phenomenon, we have only two alternatives before us. Creation is not one of these, inasmuch as we are carried by such an act out of the universe altogether. We are, therefore, driven to look to some kind of development as the cause of the appearance of the visible universe. This development may either have been through the living or through the dead; either it was the result of a natural operation of the invisible universe, or it was brought about by means of intelligence residing in that universe and working through its laws. To determine which of these two alternatives is most admissible, we must bear in mind the nature of the production, and argue about it just as we should argue about anything else.

213. Now, this production was, as far as we can judge, a sporadic or abrupt act, and the substance produced, that is to say the atoms which form the material substratum of the present universe bear (as Herschel and Clerk-Maxwell have well said) from their uniformity of constitution all the marks of being manufactured articles.

Whether we regard the various elementary atoms as separate productions, or (according to Prout and Lockyer) view them as produced by the coming together of some smaller kind of primordial atom—in either case, and even specially so in the latter case, we think that they look like manufactured articles. Indeed, we have already shown (Art. 164) that development without life, that is to say, dead development, does not tend to produce uniformity of structure in the products which it gives rise to.

214. Thus the argument is in favour of the production of the visible universe by means of an intelligent agency residing in the invisible universe.

But again let us realise the position in which we are placed by the principle of Continuity—we are led by it not only to regard the invisible universe as having existed before the present one, but the same principle drives us to acknowledge its existence in some form as a universe from all eternity. Now we can readily conceive a universe containing conditioned intelligent beings to have existed before the present; nay, to have existed for a time greater than any assignable time, which is the only way in which our thoughts can approach the eternal. But is it equally easy to conceive a dead universe to have existed in the same way during immeasurable ages? Is a dead universe a fully conditioned universe? For, regarding the laws of the universe as those laws according to which the intelligences of the universe are conditioned by the Governor thereof, can we conceive a dead universe to exist permanently without some being to be conditioned? Is not this something without meaning, an unreality—a make-believe? And if it be said that under these circumstances the conception in any form of immeasurable ages of time is unreal, we may reply by granting it, and asserting that in such a case we are driven not merely from the fully conditioned to the partially conditioned, but even to the unconditioned; in other words, the hypothesis of a permanently dead universe would hardly appear to satisfy the principle of Continuity, which prefers to proceed from one form of the fully conditioned to another.

215. For the benefit of our readers we shall now endeavour to review as clearly as we can the point at which we have arrived, and the steps which have brought us to it.

It will be remembered that in our definition (Art. 54) we agreed to look upon the Creator—the Absolute One, as

conditioning the universe, confining the term universe to that which is conditioned. Thus we conceive a stone to be in the universe, we conceive a man to be in the universe, and to work in it, but we conceive Absolute Deity to be above the universe rather than to work in it in any way analogous to that in which a man works in it. Would there not be a confusion of thought if we regarded the same Person as conditioning and yet conditioned? Now, what the principle of Continuity demands is an endless development of the conditioned. We claim it as the heritage of intelligence that there shall be an endless vista, reaching from eternity to eternity, in each link of which we shall be led only from one form of the conditioned to another, never from the conditioned to the unconditioned or absolute, which would be to us no better than an impenetrable intellectual barrier. It has also been seen that in this endless chain of conditioned existence we cannot be satisfied with a make-believe universe, or one consisting only of dead matter, but prefer a living intelligent universe, in other words, one fully conditioned. Finally, our argument has led us to regard the production of the visible universe as brought about by an intelligent agency residing in the unseen.

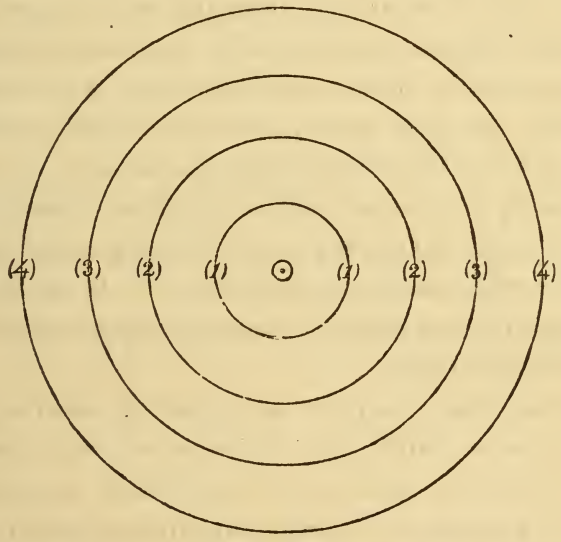
216. We have arrived at this result from general principles, and without any definite theory as to the *modus operandi* of the intelligent developing agency which resides in the unseen universe. When we keep to well-ascertained principles we are on solid ground, but when we speculate on the method by which the development is accomplished we enter a very different region, where the chances are greatly against our particular hypothesis representing the truth. Nevertheless, *for the sake of bringing our ideas in a concrete form before*

the reader, and for this purpose only, we will now adopt a definite hypothesis. Let us begin by supposing an intelligent agent in the present visible universe,—that is to say a man—to be developing vortex rings—smoke-rings, let us imagine. Now, these smoke-rings are found to act upon one another, just as if they were things or existences; nevertheless their existence is ephemeral, they only last a few seconds. But we may imagine them to constitute the grossest possible form of material existence. Now, each smoke-ring has in it a multitude of smaller particles of air and smoke, each of these particles being the molecules of which the present visible universe is composed. These molecules are of a vastly more refined and delicate organisation than the large smoke-ring; they have lasted many millions of years, and will perhaps last many millions more. Nevertheless, let us imagine that they had a beginning, and that they will also come to an end similar to that of the smoke-ring. In fact, just as the smoke-ring was developed out of ordinary molecules, so we may imagine ordinary molecules to be developed as vortex rings out of something much finer and more subtle than themselves, which we have agreed to call the invisible universe. But we may pursue the same train of thought still further back, and imagine the entities which constitute the invisible universe immediately preceding ours to be in themselves ephemeral, although not nearly to the same extent as the atoms of our universe, and to have been formed in their turn as vortex rings out of some still subtler and more enduring substance. In fine, there is no end to such a process, but we are led on from rank to rank of the order imagined by Dr. Thomas Young, or by Professor Jevons, when he says, "That the smallest particle of solid substance may consist of a vast number

of systems united in regular order, each bounded by the other, communicating with it in some manner yet wholly incomprehensible." Our meaning will be made clear by the following diagram.

Here (0) denotes the evanescent smoke-ring, (1) the visible universe, (2) the invisible universe immediately anterior to the present, (3) that of the next order, and so on.

Again, (0) is developed out of (1); (1) is developed out of (2); (2) out of (3); (3) out of (4), and so on. Further,



(1) both precedes and follows (0) in point of duration, while (2) bears a similar relation to (1), (3) to (2), and so on.

Again, the material substance of (0) is a phenomenon of that of (1), that of (1) a phenomenon of that of (2), and so on. Go back as far as we choose, we are only led from one phenomenon to another; so that, as far as their essential nature is concerned, all are equally phenomenal, and the mind cannot repose in any order as its ultimate haven

of thought, but is driven inexorably forward to look for something different.

We see too, that, as far as energy is concerned, that of (1) is greater than that of (0), inasmuch as (1) develops (0), that of (2) greater than that of (1), inasmuch as (2) develops (1), and so on. Therefore, if we go infinitely far back, we shall be led to a universe possessing infinite energy, and of which the intelligent developing agency possesses infinite energy.

It will also be seen that, inasmuch as all these various orders exist together at the present moment, the energy of their sum must be infinite, and this energy will never come to an end. In other words, the Great Whole is infinite in energy, and will last from eternity to eternity.

217. Now, what means this mysterious, infinitely energetic, intelligent developing agency residing *in* the universe, and therefore in some sense conditioned? In endeavouring to reply to this question, we cannot do better than consult the Christian records.

These records, as they are interpreted by the majority of the disciples of Christ, are believed to lead to a conception of the Godhead, in which there is a plurality of persons but a unity of substance. It ought, however, to be remembered that here the word *person* does not mean the same thing as it does when applied to ourselves, but only denotes some distinction that may be regarded as best expressed by this word. *Our* idea of person or individual is derived solely from our experience in that position which *we* occupy in the universe.

218. The first Person in this Trinity, God the Father, is represented as the unapproachable Creator—the Being in virtue of whom all things exist.

Thus it is said (John i. 18), "No man hath seen God at any time; the only begotten Son which is in the bosom of the Father, he hath declared him."

Again, Paul tells us (Rom. xi. 36), "For of him and through him and to him are all things." Also (1 Cor. viii. 6), "But to us there is but one God, the Father, of whom are all things, and we to him (εἰς αὐτόν); and one Lord Jesus Christ, by whom are all things, and we by him."

Also (Eph. iv. 6), "One God and Father of all, who is above all, and through all, and in all." Also (1 Timothy vi. 16), "Who only hath immortality, dwelling in the light which no man can approach unto; whom no man hath seen, nor can see."

219. Again, of the second Person of the Trinity we are told, in addition to what we gather from the expressions just quoted (John i. 1), "In the beginning was the Word, and the Word was with God, and the Word was God. The same was in the beginning with God. All things were made by him, and without him was not any thing made that was made."

Again (2 Cor. v. 10): "For we must all appear before the judgment-seat of Christ."

Again (Col. i. 15): "Who is the image of the invisible God, the first-born of every creature: for in him were all things created that are in heaven, and that are in earth, visible and invisible, whether they be thrones, or dominions, or principalities, or powers."

Again (Heb. i. 1): "God, who at sundry times, and in divers manners, spoke in time past unto the fathers by the prophets, hath in these last days spoken unto us by his Son, whom he hath appointed heir of all things, by whom also he made the worlds."

220. It is, we believe, a prevalent idea among theologians that these passages indicate, in the first place, the existence of an unapproachable Creator—the unconditioned One who is spoken of as God the Father ; and that they also indicate the existence of another Being of the same substance as the Father, but different in person, and who has agreed to develop the will of the Father, and thus in some mysterious sense to submit to conditions and to enter into the universe. The relation of this Being to the Father is expressed in Hebrews[1] in the words of the Psalmist, "Then said I, Lo, I come: in the volume of the book it is written of me, I delight to do thy will, O my God: yea, thy law is within my heart." In fine, such a Being would represent that conditioned, yet infinitely powerful developing agent, which the universe, objectively considered, appears to lead up to. His work is twofold, for, in the first place, he develops the various universes or orders of being; and secondly, in some mysterious way He becomes Himself the type and pattern of each order, the representative of Deity, as far as the beings of that order can comprehend, especially manifesting such divine qualities as could not otherwise be brought to light.

Such a being is therefore, in virtue of His office, the King of angels and ruler of the invisible universe, and to him the words in the poem of Job are supposed to apply (Job i. 6): "Now there was a day when the Sons of God came to present themselves before the Lord, and Satan came also among them."

221. It would thus appear that what may be termed the Christian theory of development has a twofold aspect, a de-

[1] Heb. x. 7.

scent and an ascent; the descent of the Son of God through the various grades of existence, and the consequent ascent of the intelligences of each led up by him to a higher level,—a stooping on the part of the developing Being, in order that there may be a mounting up on the part of the developed. Thus it is said (John iii. 16), "And no man hath ascended up to heaven, but he that came down from heaven, even the Son of man which is in heaven." Again (Eph. iv. 9): "Now that he ascended, what is it but that he also descended first into the lower parts of the earth? He that descended is the same also that ascended up far above all heavens, that he might fill all things."

222. It is naturally in accordance with these views that the Angelic Host should be represented as taking an intelligent interest, even if they did not, as the Gnostics thought, take an active part, in the creation of the visible universe. Thus the Lord is represented as asking Job (Job xxxviii. 4), "Where wast thou when I laid the foundations of the earth? declare, if thou hast understanding. Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it? Whereupon are the foundations thereof fastened? or who laid the corner-stone thereof, when the morning-stars sang together, and all the sons of God shouted for joy."

223. It is also in accordance with these views that the same hierarchy should take an intelligent interest in the life of Christ. Thus we read (Luke ii. 13), "And suddenly there was with the angel a multitude of the heavenly host praising God, and saying, Glory to God in the highest, and on earth peace, good-will toward men." And again (1 Timothy iii. 16): "And without controversy great is the mystery of godliness: God was manifest in the flesh, justified in

the Spirit, seen of angels, preached unto the Gentiles, believed on in the world, received up into glory."

224. It will be remarked that the views which we have now put before our readers have been developed more especially from the objective point of view, and that our reasoning has been founded on the principle of Continuity as applied to the outward universe. In truth we seem to get a much firmer and more tangible hold on the objective element of the universe, that is to say, on energy (Art. 103), than we can on intelligence and life. For if we approach our individual consciousness it is very manifest that we have no well-founded principle wherewith to guide our speculations similar to the principle of Continuity; for this, if we had it, would at once inform us whether the doctrine of immortality was true or false.

We know very well that the universe will remain after we are laid in the grave, but some of us are not equally certain whether we ourselves shall then continue to exist.

Thus there appears to be a difficulty which we see at present no means of surmounting in dealing with individual consciousness. But while the continuance of individual life is enveloped in mystery, it is believed that we have obtained hold of a general principle regarding the distribution of life not greatly inferior in breadth and generality to the law of Continuity. We mean the principle that life proceeds from life, or to speak more accurately, that a conditioned living thing proceeds only from a conditioned living thing. That dead matter cannot produce a living organism is the universal experience of the most eminent physiologists. In fact, the law of Biogenesis is justly regarded by Professor Huxley and others as the great principle underlying all the phenomena of organised existence.

Professor Roscoe, again, approaching the subject from the chemical point of view, says, speaking of red blood corpuscles, "We have not been able, and the evidence at present rather goes to show that there is not much hope of our being able, to construct these granules artificially; and the question is in this position, that so far as science has progressed at present we have not been able to obtain any organism without the intervention of some sort of previously existing germ."

225. If we assume the truth of this principle it appears to lead us directly to infer that life is not merely a species of energy, or a phenomenon of matter. For we have seen (Art. 103) that the great characteristic of all energy is its transmutability—its Protean power of passing from one form to another. We may no doubt produce large quantities of electricity by means of an electric nucleus, but we can do the same without any such nucleus—we may produce fire from a spark, but we can obtain it without a spark.

Life, however, can only be produced from life, and this law would seem to be an indication that the solution of the mystery is not to be found by making life merely a species of energy. It is some time since we gave up the idea that life could generate energy; it now seems that we must give up the idea that energy can generate life.

226. In the preceding chapters we have given our readers a sketch of the method according to which men of science imagine that evolution has been carried out both in the universe of energy and in that of life. In both worlds the principle of Continuity demands that in endeavouring to account for the origin of phenomena we do not resort to the hypothesis of separate creations, that we do not pass over from the conditioned to the unconditioned; and Darwin, Wallace, and their followers have, as we have shown, en-

deavoured to prove that processes at present pursued by nature are sufficient in a great measure, if not entirely, to account for the present development of organised existence without the necessity of resorting to separate creations. Darwin especially imagines that all the present organisms, including man, may have been derived by the process of natural selection from a single primordial germ. When, however, the backward process has reached this germ, an insuperable difficulty presents itself. How was this germ produced? All experience tells us that life can only be produced from a living antecedent; now what was the antecedent of this germ? Hypotheses have no doubt been started, but we cannot regard them in any other light than as an acknowledgment of a difficulty that cannot be overcome. We appear to have reached an impenetrable barrier similar to that which stood in our way when we contemplated the production of the visible universe. And we must likewise assert for ourselves with becoming reverence a similar freedom of action in dealing with this second barrier. Therefore, if life be one of the things of the universe, if a creation of life in time be inadmissible, and if it be contrary to all experience to suppose the production of life without an antecedent possessing life, we are entitled to make use of this conclusion derived from experience even in such a case as the present, and contemplate an antecedent possessing life and giving life to this primordial germ,—an antecedent in the universe, not out of it,—conditioned, not unconditioned. Now, what is the meaning of this conclusion? In the first place, it does not mean that the antecedent to the primordial germ must be a like germ, for we know from experience that while life is always produced from life, like is not always produced from like. In this case more especi-

ally the living antecedent must be in the invisible universe, and therefore very different from the germ.

227. If we now turn once more to the Christian system, we shall find that it recognises such an antecedent as an agent in the universe. He is styled the Lord and Giver of Life. The third Person of the Trinity is regarded in this system as working in the universe, and therefore in some sense as conditioned, and as distributing and developing this principle of life, which we are forced to regard as one of the things of the universe, in the same manner as the second Person of the Trinity is regarded as developing that other phenomenon, the energy of the universe. The one has entered from everlasting into the universe, in order to develop its objective element, energy; the other has also entered from everlasting into the universe, in order to develop its subjective element, life.

Thus we read (Gen. i. 2), "And the earth was without form and void; and darkness was upon the face of the deep: and the spirit of God moved upon the face of the waters;" implying, we may imagine, a peculiar operation of this Spirit preceding the advent of life into the world. Again, when in the fulness of time Christ, the developing agent, made his appearance here, and submitted to the trammels of a human nature, this appearance was preceded by an operation of the same Spirit.

228. It may here be desirable to discuss somewhat fully the position of life in the universe.

If then the matter of this present visible universe be not capable of itself, that is to say, in virtue of the forces and qualities with which it has been endowed, of generating life; but if we must look to the unseen universe for the origin of life, this would appear to imply that the peculiar

collocation of matter which accompanies the operations of life is not a mere grouping of particles of the visible universe, but implies likewise some peculiarity in the connection of these with the unseen universe. May it not denote in fact some peculiarity of structure extending to the unseen?

In fine, to go a step further, may not life denote a peculiarity of structure which is handed over not merely from one stage to another—from the invisible to the visible—but which rises upward from the very lowest structural depths of the material of the universe, looking upon this material as possessed of an infinitely complex structure such as we have pictured to our readers in a previous part of this chapter (Art. 216).

If we suppose any such peculiarity to accompany life we shall at once see the impossibility of its originating in the visible universe alone.

229. Again, it is well known to many of our readers that discussions have frequently arisen regarding the peculiar place and function of life in the universe. What is its relation to energy? it certainly does not create energy—what then does it do?

One way of replying to this question is indicated in the following passage, which we have quoted at length from an article upon "The Atomic Theory of Lucretius," in the *North British Review* for March 1868:—

"It is a principle of mechanics that a force acting at right angles to the direction in which a body is moving does no work, although it may continually and continuously alter the direction in which the body moves. No power, no energy, is required to deflect a bullet from its path, provided the deflecting force acts always at right angles to that path. . . .

"If you believe in free-will and in atoms, you have two courses open to you. The first alternative may be put as follows: Some-

thing which is not atoms must be allowed an existence, and must be supposed capable of acting on the atoms. The atoms may, as Democritus believed, build up a huge mechanical structure, each wheel of which drives its neighbour in one long inevitable sequence of causation; but you may assume that beyond this ever-grinding wheelwork there exists a power not subject to but partly master of the machine; you may believe that man possesses such a power, and if so, no better conception of the manner of its action could be devised than the idea of its deflecting the atoms in their onward path to the right or left of that line in which they would naturally move. The will, if it so acted, would add nothing sensible to nor take anything sensible from the energy of the universe. The modern believer in free-will will probably adopt this view, which is certainly consistent with observation, although not proved by it. Such a power of moulding circumstances, of turning the torrent to the right, where it shall fertilise, or to the left, where it shall overwhelm, but in nowise of arresting the torrent, adding nothing to it, taking nothing from it,—such is precisely the apparent action of man's will; and though we must allow that possibly the deflecting action does but result from some smaller subtler stream of circumstance, yet if we may trust to our direct perception of free-will, the above theory, involving a power in man beyond that of atoms, would probably be our choice. . . .

"We cannot hope that natural science will ever lend the least assistance towards answering the Free-will and Necessity question. The doctrines of the indestructibility of matter and of the conservation of energy seem at first sight to help the Necessitarians, for they might argue that if free-will acts it must add something to or take something from the physical universe, and if experiment shows that nothing of the kind occurs, away goes free-will; but this argument is worthless, for if mind or will simply deflects matter as it moves, it may produce all the consequences claimed by the Wilful school, and yet it will neither add energy nor matter to the universe."

230. Now there appears to us to be a very serious objection to this method of regarding the position of life, unless it be somewhat modified. Let us take one of the visible masses of this present universe, such as a planet. Instead of being

attracted to a fixed and visible centre of force such as the sun, suppose for a moment that it is bound to an invisible and vagrant centre, of which the only condition imposed upon its irregularities is that it shall always move in such a manner that there shall be no creation nor destruction of energy.

We have only to imagine for a moment such a universe in order to realise the inextricable confusion into which its intelligent inhabitants would be plunged by the operation of a viewless and unaccountable agency of this nature. No doubt the hypothesis regarding life, which we have quoted above, limits this mode of action to the molecular motions of matter, but if our line of argument has been followed throughout, the reader will probably acknowledge that the superior intelligences of the universe may have the same appreciation of molecular motions that we have of those of large masses. Now they would in turn be put to inextricable confusion by the advent of an unperceivable, and, from the nature of the case, irresponsible force entitled *will* operating towards the deflection of these molecular motions, even although the energy of the universe should remain the same. We think that Professor Huxley and those who have opposed this mode of regarding the position of life have been somewhat unjustly blamed. They have driven the operation of that mystery called life or will out of the objective universe, or that portion of things which is capable of being scientifically studied by intelligence, and in so doing they have most assuredly done right. The mistake made (whether by this party or their adversaries) lies in imagining that by this process they completely get rid of a thing so driven before them, and that it disappears from the universe altogether. It does no such thing. It only dis-

appears from that small circle of light which we may call the universe of scientific perception.

But the greater the circle of light (to adopt the words of Dr. Chalmers), the greater the circumference of darkness, and the mystery which has been driven before us looms in the darkness that surrounds this circle, growing more mysterious and more tremendous as the circumference is increased. In fine, we have already remarked that the position of the scientific man is to clear a space before him from which all mystery shall be driven away, and in which there shall be nothing but matter and certain definite laws which he can comprehend. There are however three great mysteries (a trinity of mysteries) which elude, and will for ever elude his grasp, and these will persistently hover around the border of this cleared and illuminated circle,—they are the mystery of matter; the mystery of life; and the mystery of God,—and these three are one.

231. But in this latter statement we have transgressed the limits of our inquiry, and are content to be driven back. Suffice it to say that these three gigantic mysteries will persistently hover around the illuminated circle, or to speak more properly, the illuminated sphere of scientific thought, of which duration, extension, and structural complexity may be regarded as the three rectangular axes in each of which the process of development goes on simultaneously as the boundary of the sphere is enlarged.

Within this sphere we have only that which can be grasped by Physical Science, but we are not therefore to infer that matter and the laws of matter have a reality and a permanence denied to intelligence.

It is rather because they are at the bottom of the list—are in fact the simplest and lowest of the three—that they

are capable of being most readily grasped by the finite intelligences of the universe. The following words of Professor Stokes, in his presidential address to the British Association at Exeter, occur to us as very clearly embodying this thought :—

"Admitting to the full as highly probable, though not completely demonstrated, the applicability to living beings of the laws which have been ascertained with reference to dead matter, I feel constrained at the same time to admit the existence of a mysterious *something* lying beyond, a something *sui generis*, which I regard, not as balancing and suspending the ordinary physical laws, but as working with them and through them to the attainment of a designed end. What this *something* which we call life may be is a profound mystery. . . . When from the phenomena of life we pass on to those of mind, we enter a region still more profoundly mysterious. We can readily imagine that we *may* here be dealing with phenomena altogether transcending those of mere life, in some such way as those of life transcend, as I have endeavoured to infer, those of chemistry and molecular attractions, or as the laws of chemical affinity in their turn transcend those of mere mechanics. Science can be expected to do but little to aid us here, since the instrument of research is itself the object of investigation. It can but enlighten us as to the depths of our ignorance, and lead us to look to a higher aid for that which most nearly concerns our well-being."

232. In fine, the Physical properties of matter form the alphabet which is put into our hands by God, the study of which will, if properly conducted, enable us more perfectly to read that Great Book which we call the Universe.

We have begun to recognise some of the chief letters of this alphabet, and even to put two and two together; and, like an intelligent but somewhat conceited child, we are very proud of our achievement. Like such a child we have not yet, however, completely grasped the fact that these letters are only symbols, but look upon them with intense awe as

the great thing in the world, meaning of course our world. We look with a sort of adoration towards those pages in which there are words of two syllables, and are ready to fall down at the feet of that older and wiser child who has penetrated into the depths of such profound mysteries. Our belief is that all knowledge is made for the alphabet just as the little musician believes that all music is made for the piano.

233. Life, then, whatever be its nature, may be supposed to penetrate into the structural depths of the universe. Its seat is in a region inaccessible to human inquiry and equally inaccessible, we may well suppose, to the inquiries of the higher created intelligences. Intimations of its presence are no doubt constantly emerging from this region of thick darkness into the objective universe, but when they have reached it they obey the ordinary laws of phenomena, according to which a material effect implies a material antecedent.

Notwithstanding all this, life exists just as surely as the Deity exists. For we have subjected both these mysteries to the same process, and have found it as difficult to rid ourselves of the one as of the other.

We have driven the creative operation of the Great First Cause into the durational depths of the universe,—into the eternity of the past,—but for all that we have not got rid of God. In like manner we have driven the mystery of life into the structural depths of the universe,—that region of thick darkness which no created eye is able to pierce,—but we have not got rid of life, nor are we likely to do so. Before concluding this digression upon the place of life, let us briefly review the attempts made to account for the origin of life by those who have yet fallen short of the scientific conception of an Unseen Universe.

234. Sir W. Thomson has gone further than any one else in such inquiries. We have already alluded to his attempt to explain the origin of the material universe by the vortex ring hypothesis, and also to his other attempt to explain gravitation by the modification of the hypothesis of ultra-mundane corpuscles. If we add to these his attempt to explain the origin of life as consistently as possible with the principle of Continuity, we think it must be acknowledged that he is a true pioneer in such inquiries as those of this volume as well as in the more ordinary branches of Physical Science.

The explanation of the origin of life proposed by Sir W. Thomson had also occurred independently to Professor Helmholtz. This latter physicist, in an article on the use and abuse of the deductive method in Physical Science,[1] tells us very clearly what led himself, and no doubt Sir W. Thomson likewise, to suggest the meteoric hypothesis as a possible way of accounting for the origin of life :—"If failure attends all our efforts to obtain a generation of organisms from lifeless matter, it seems to me (says Professor Helmholtz) a thoroughly correct procedure to inquire whether there has ever been an origination of life, or whether it is not as old as matter, and whether its germs, borne from one world to another, have not been developed wherever they have found a favourable soil."

235. We have already sufficiently pointed out that the man of science objects to separate creations, and that, in consequence, he tries to explain the present terrestrial life by means of a single primordial germ. But the difficulty still remains regarding the original appearance of this germ.

Now, according to the meteoric hypothesis this germ may

[1] *Nature*, January 14, 1875.

have been wafted to us from some other world, or its fragments, and thus an act of creation of life might possibly serve for many worlds. If therefore this hypothesis were otherwise tenable it would diminish the difficulty implied by separate creations, but would it entirely remove it? We doubt this very much.

For, in the first place, as far as we can judge (Art. 163) the visible universe—the universe of worlds—is not eternal, while however the invisible universe, or that which we associate with the ethereal medium, is necessarily eternal. The visible universe must have had its origin in time (Art. 116), no doubt from a nebulous condition. But in this condition it can hardly have been fit for the reception of life. Life must therefore have been created afterwards. We have thus at least two separate creations, both taking place in time—the one of matter and the other of life. And even if it were possible, which it is not, to get over one of the difficulties attending this hypothesis, that of creation in time, by regarding the visible universe as eternal; yet even then we must regard matter and life as implying two separate creative acts if we assume the nebulous hypothesis to be true. For if x denote the date of the advent of life, and $x+a$ that of the advent of matter, a being a constant quantity, the two operations cannot be made simultaneous by merely increasing the value of x without limit. Now this is what we mean by eternity, and therefore we cannot help thinking that this want of simultaneity implies a defect in this mode of viewing the origin of things.

In fine, our hypothesis, in which the material as well as the life of the visible universe are regarded as having been developed from the Unseen, in which they had existed from

Eternity, appears to us to present the only available method of avoiding a break of continuity, if at the same time we are to accept loyally the indications given by observation and experiment. It may be said (just as anything else may be said) that the visible universe is eternal, and that it has the power of originating life; but both statements are surely opposed to the results of observation and experiment. Now we must be content in such matters as these to be guided by probabilities, and it certainly appears most probable that the visible universe is *not* eternal, and that it has *not* the power of originating life. In fine, life as well as matter comes to us from the Unseen Universe.

236. Let us here again pause for a moment and review the position which we have reached. By taking the universe as we find it, and regarding each occurrence in it, without exception, as something upon which it was meant that we should exercise our intellects, we are led at once to the principle of Continuity, which asserts that we shall never be carried from the conditioned to the unconditioned, but only from one order of the fully conditioned to another. Two great laws or principles come before us: the one of which is the Conservation of Energy; that is to say, conservation of the objective element of the universe; while the other is the law of Biogenesis, in virtue of which the appearance of a living Being in the universe denotes the existence of an antecedent possessing life. We are led from these two great principles to regard, as at least the most probable solution, that there is an intelligent Agent operating in the universe, whose function it is to develop energy; and also that there is a similar Agent whose function it is to develop life. Perhaps we ought rather to say that, if we are not driven to this very conclusion, it

appears at least to be the one which most simply and naturally satisfies the principle of Continuity.

But this conclusion hardly differs from the Christian doctrine ; or, to speak properly, the conclusion, as far as it goes, appears to agree with the Christian doctrine.

In fine, we are led to regard it as one of the great merits of the Christian system, that its doctrine is pre-eminently one of intellectual liberty, and that while theologians on the one hand, and men of science on the other, have each erected their barriers to inquiry, the early Christian records acknowledge no such barrier, but on the contrary assert the most perfect freedom for all the powers of man.

237. We have now reached a stage from which we can very easily dispose of any scientific difficulty regarding miracles. For if the invisible was able to produce the present visible universe with all its energy, it could of course, *a fortiori*, very easily produce such transmutations of energy from the one universe into the other as would account for the events which took place in Judea. Those events are therefore no longer to be regarded as absolute breaks of continuity, a thing which we have agreed to consider impossible, but only as the result of a peculiar action of the invisible upon the visible universe. When we dig up an ant-hill, we perform an operation which, to the inhabitants of the hill, is mysteriously perplexing, far transcending their experience, but *we* know very well that the whole affair happens without any breach of continuity of the laws of the universe. In like manner, the scientific difficulty with regard to miracles will, we think, entirely disappear, if our view of the invisible universe be accepted, or indeed if any view be accepted that implies the presence in it of living beings much more powerful than ourselves.

238. We have as yet only replied to the scientific objection, but there are other objections which might be raised. Thus, for instance, it might be said, What occasion was there for the interference implied in miracles? And again, Is the historical testimony in favour of their occurrence conclusive? We must leave the last objection to be replied to by the historian; but with respect to the former, it appears to us as almost self-evident that Christ, if He came to us from the invisible world, could hardly (with reverence be it spoken) have done so without some peculiar sort of communication being established between the two worlds. No doubt we may well imagine that the acts of interference in virtue of this communication were strictly limited; and in proof of this conclusion we may cite the fact that what did occur was sufficiently startling to have secured the ear of humanity ever since, but not sufficiently overwhelming to preclude the exercise of individual faith. The very fact of there being sincere sceptics proves, we think, the limited extent of these interferences.[1]

239. We have now considered miracles, or those apparent breaks of continuity which have been furnished by history, but our readers are already well aware that equally formidable breaks are brought before us by science. There is, to begin with, that formidable phenomenon, the production in time of the visible universe. Secondly, there is that break, hardly less formidable, namely, the original production of life; and there is, thirdly, that break recognised by Wallace and his school of natural history, which seems to have occurred at the first production of man. Greatly as we are indebted to Darwin, Huxley, and those who have prominently advocated the possibility of the present system of

[1] See Sermon preached at Belfast by Dr. Reichel, August 23, 1874.

things having been developed by forces and operations such as we see before us, it must be regarded by us, and we think it is regarded by them, as a defect in their system, that these breaks remain unaccounted for. Our readers will now, however, if we mistake not, perceive what is the real source of the perplexity felt by the school of evolutionists. It is that they have been unable to regard an interference of the invisible universe in any other light than an absolute break of continuity; and holding with justice to the principle of Continuity, they have been unable to do more than acknowledge these difficulties and allow them to remain.

But from our point of view these difficulties are by no means impenetrable barriers, barring for ever the progress of research. On the contrary, we assert that, if approached with sufficient boldness, and examined with sufficient care, they will be found to contain avenues leading up to the invisible universe, and directing our inquiries thitherwards. There may be possibly other apparent breaks or barriers, but these appear to be the best established; and, with these exceptions, we may suppose that the visible universe, in so far as we are capable of investigating it, has been left to develop itself in accordance with those forces and operations which we see before us at the present day.

In fine, the visible universe was plainly intended to be something which we are capable of investigating, and the few apparent breaks are in reality so many partially concealed avenues leading up to the unseen.

240. Our readers must not however infer from what we have now said, that we do not recognise any present points of contact between us and the invisible. There may possibly be (but even of this we are not quite sure) no points of

apparent interference between the two, so that the man of science cannot say,—Here is a break;—but nevertheless there may be *a close and vital union* between the two universes, in those regions into which investigation cannot penetrate. There may be an action of the invisible world upon the individual mind, and there is no reason why there should not also be an action upon the visible universe, by means of those processes of delicacy which, as we have already seen, obtain in that quarter (Art. 184). Neither the one action nor the other would be detected by science, unless we except certain providential occurrences, which are generally, however, better recognised by the individuals to whom they refer than by the world at large. And just as reversibility (Art. 113) is the stamp of perfection in the inanimate engine, so a similar reversibility may be the stamp of perfection in the living man. He ought to live for the unseen—to carry into it something which may not be wholly unacceptable. But, in order to enable him to do this, the unseen must also work upon him, and its influences must pervade his spiritual nature. Thus a life *for* the unseen *through* the unseen is to be regarded as the only perfect life.

241. In fine, the unseen may have a very wide field of influence, but it is not discernible, or at least easily discernible, by the eye of sense, and we are therefore led to consult the Christian records regarding the reality of a present influence exercised by the invisible universe upon ours.

In the first place, we have the following words of Christ himself (Matt. xiii. 41): "The Son of man shall send forth his angels, and they shall gather out of his kingdom all things that offend, and them which do iniquity, and shall cast them into a furnace of fire: there shall be wailing and

gnashing of teeth. Then shall the righteous shine forth as the sun in the kingdom of their Father." Again (Matt. xxv. 31): "When the Son of man shall come in his glory, and all the holy angels with him, then shall he sit upon the throne of his glory: and before him shall be gathered all nations; and he shall separate them one from another, as a shepherd divideth his sheep from the goats." Again (Matt. xxvi. 53), speaking to Peter: "Thinkest thou that I cannot now pray to my Father, and he shall presently give me more than twelve legions of angels?" Furthermore, we read (Heb. i. 14): "Are they not all ministering spirits, sent forth to minister for them who shall be heirs of salvation?"

These passages (and many more might be quoted) would appear to show that, according to the Scriptures, the angels take a very prominent part in the administration of the universe under the direction of the Son of God. They are his ministers, his messengers, who execute his decrees and perform his errands, whether of mercy or of justice. Therefore it is said of Christ, "Thou art the King of angels;" and of himself in his glorified state, speaking to his disciples, Christ says (Matt. xxviii. 18): "All power is given unto me in heaven and in earth. Go ye therefore, and teach all nations, baptising them in the name of the Father, and of the Son, and of the Holy Ghost, teaching them to observe all things whatsoever I have commanded you; and, lo, I am with you alway, even unto the end of the world."

Let us close these quotations by one from the Old Testament—2 Kings vi. 15-17: "And when the servant of the man of God was risen early, and gone forth, behold, an host encompassed the city both with horses and chariots: and his

servant said unto him, Alas, my master! how shall we do? And he answered, Fear not; for they that be with us are more than they that be with them. And Elisha prayed, and said, Lord, I pray thee, open his eyes, that he may see. And the Lord opened the eyes of the young man: and he saw: and, behold, the mountain was full of horses and chariots of fire round about Elisha."

Finally, it is the belief of a large portion of the Christian Church that the Spirit of God dwells in and acts upon the souls of believers. This action represents the influence which reaches the soul of man *from* the unseen, enabling him to live *for* the unseen.

242. We have in our opening chapter quoted a very remarkable passage from Swedenborg upon the particular nature of God's providence. Let us now hear what the Scriptures say upon the same subject. Christ tells us (Luke xii. 6): "Are not five sparrows sold for two farthings, and not one of them is forgotten before God? But even the very hairs of your head are all numbered. Fear not therefore: ye are of more value than many sparrows." Again St. Paul tells us (Rom. viii. 28): "And we know that all things work together for good to them that love God, to them who are called according to his purpose." Also (Rom. viii. 38): "For I am persuaded, that neither death, nor life, nor angels, nor principalities, nor powers, nor things present, nor things to come, nor height, nor depth, nor any other creature, shall be able to separate us from the love of God, which is in Christ Jesus our Lord."

243. We think it may be concluded from all these passages that the doctrine of a particular providence is taught in the Scriptures. Nevertheless it is one of the hardest things to understand how this doctrine can be made consistent

with the working out of general laws which, so far as we can study them, appear to have no reference whatever to individuals. This was a difficulty intensely felt by the late John Stuart Mill. He says, in a work published after his death :—

"For how stands the fact? That, next to the greatness of these cosmic forces, the quality which most forcibly strikes every one who does not avert his eyes from it is their perfect and absolute recklessness. They go straight to their end without regarding what or whom they crush on the road. Optimists, in their attempts to prove that 'whatever is, is right,' are obliged to maintain, not that Nature ever turns one step from her path to avoid trampling us into destruction, but that it would be very unreasonable in us to expect that she should. Pope's 'Shall gravitation cease when you go by?' may be a just rebuke to any one who should be so silly as to expect common human morality from Nature. But if the question were between two men, instead of between a man and a natural phenomenon, that triumphant apostrophe would be thought a rare piece of impudence. A man who should persist in hurling stones or firing cannon when another man 'goes by,' and, having killed him, should urge a similar plea in exculpation, would very deservedly be found guilty of murder. In sober truth, nearly all the things which men are hanged or imprisoned for doing to one another are Nature's every-day performances."

This objection to belief in the reality of the government of God has been clothed in very eloquent language in a sermon by the Rev. James Martineau :—"The battle of existence (he tells us, putting himself for the moment into the position of Mill and his school) rages through all time and in every field; and its rule is to give no quarter—to despatch the maimed, to overtake the halt, to trip up the blind, and drive the fugitive host over the precipice into the sea."

In very beautiful language the poet Tennyson, after proposing the same riddle, replies to it thus :—

"Are God and Nature then at strife
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life;
. . . . .
'So careful of the type'? but no.
From scarped cliff and quarried stone
She cries, a thousand types are gone:
I care for nothing: all shall go.
. . . . .
O life as futile, then, as frail!
O for thy voice to soothe and bless!
What hope of answer or redress?
Behind the veil, behind the veil."

In another passage of equal beauty the same poet expresses his conviction

"That nothing walks with aimless feet:
That not one life shall be destroy'd
Or cast as rubbish to the void,
When God hath made the pile complete.

That not a worm is cloven in vain;
That not a moth with vain desire
Is shrivel'd in a fruitless fire,
Or but subserves another's gain."

Professor Jevons, again, in his *Principles of Science* (vol. ii. p. 468) alludes in the following terms to this difficulty :— "The hypothesis, that there is a Creator, at once all-powerful and all-benevolent, is surrounded, as it must seem to every candid investigator, with difficulties verging closely upon logical contradiction. The existence of the smallest amount of pain and evil would seem to show that He is either not

perfectly benevolent, or not all-powerful. No one can have lived long without experiencing sorrowful events of which the significance is inexplicable. But if we cannot succeed in avoiding contradiction in our notions of elementary geometry, can we expect that the ultimate purposes of existence shall present themselves to us with perfect clearness? I can see nothing to forbid the notion that in a higher state of intelligence much that is now obscure may become clear. We perpetually find ourselves in the position of finite minds attempting infinite problems, and can we be sure that where we see contradiction an infinite intelligence might not discover perfect logical harmony?"

244. While on this subject, there is one consideration which ought not to be forgotten. It is evident that the development of the visible universe is of such a nature that we can understand it, and to a great extent explain it by means of laws and processes with which we are familiar; nay, the order of the universe is something which it becomes our very duty to investigate. But the results of our inquiries are, and can only be, the appretiation of general laws of action. The working out of these laws can have, from this point of view, no possible reference to individual interests. If gravity acted sometimes, and at other times refrained from acting, we could derive no certain information from our experience; we could not advance in art or science, and should, in fine, be plunged into speedy confusion. Nevertheless, it is not impossible that the occurrences which take place through the action of gravity may, after all, be so arranged as to have reference to the real welfare of individuals, although this reference is not apparent, because we are not in a position to recognise it, and it is not intended that we should do so, at least in this life.

The ability to do so would be a very dangerous gift, and would go far to upset the present economy. We know very little about the bearings of events on our own best interests, and nothing at all about their bearings on those of our neighbour. We may, however, believe with Jevons, that in a future state the adaptation between the two may become apparent to us, even if we do not ourselves become instruments in bringing this adaptation about.

245. The outcome of all these speculations would thus lead us to regard the Christian system as affording a full scope for development in all respects, whether of the universe or the individual. Its law is pre-eminently that of liberty, and the doctrine of the Trinity, or something analogous to it, forms, as it were, the avenue through which the universe itself leads us up to the conception of the infinite and eternal One.

Nevertheless, not a few of our readers may be disinclined to entertain any precise conception of the divine nature. Neither atheists nor theists, they simply dismiss the Deity as being quite above their comprehension, and all doctrines founded upon certain conceptions of the Deity, as superstructures without foundation.

Now, the results regarding immortality at which we have arrived are, we think, capable of being very nearly, if not altogether, detached from all conceptions regarding the Divine essence.

We have merely to take the universe as it is, and, adopting the principle of Continuity, insist upon an endless chain of events, all fully conditioned, however far we go either backwards or forwards. This leads us at once to the conception of an invisible universe, and to see that immortality is possible without a break of continuity.

We have, however, no physical proof in favour of it, unless we allow that Christ rose from the dead. But it will be admitted that, if Christ rose from the dead, immortality becomes more than possible; it becomes probable; and we do not see that this conclusion is greatly modified by differences in our mode of regarding the exact nature of Christ.

Again, the production of the visible universe in time leads us, by the principle of Continuity, to the conception of a fully conditioned intelligent universe, existing prior to the production of the visible. And furthermore, we are induced by our argument (Art. 214) to regard the production of the visible universe as brought to pass by an intelligent agency resident in the invisible. If, then, such an agency could produce the visible universe, it could certainly accomplish the resurrection of Christ, without any break of continuity, as far as the whole universe is concerned.

246. The joys of the Christian Heaven are celebrated in Hymns which are frequently very beautiful, even if they do not mount to the sublimity of the ancient Hebrew ode. One of the finest of these is the free translation by Pope of the Latin (not originally Christian) ode standing at the commencement of this volume. It runs thus—

"Vital spark of heavenly flame!
Quit, oh, quit this mortal frame!
Trembling, hoping, ling'ring, flying;
Oh, the pain, the bliss of dying!
Cease, fond Nature, cease thy strife,
And let me languish into life!

"Hark! they whisper—angels say,
'Sister spirit, come away!'
What is this absorbs me quite;
Steals my senses, shuts my sight;

Drowns my spirits, draws my breath?
Tell me, my soul, can this be—death

"The world recedes! it disappears!
Heaven opens to my eyes!—my ears
With sounds seraphic ring:
Lend, lend your wings! I mount! I fly!
O Grave! where is thy victory?
O Death! where is thy sting?"

Again, there are some beautiful Hymns on the same subject by James Montgomery, of which the following is a specimen:—

"Friend after friend departs;
Who hath not lost a friend?
There is no union here of hearts,
That finds not here an end:
Were this frail world our only rest
Living or dying, none were blest.

"Beyond the flight of time,
Beyond the vale of death,
There surely is some blessed clime,
Where life is not a breath,
Nor life's affections transient fire,
Whose sparks fly upward and expire.

"There is a world above,
Where parting is unknown;
A whole eternity of love,
Form'd for the good alone;
And faith beholds the dying here
Translated to that happier sphere."

Lastly, we give our readers two verses from a hymn by a more recent writer (Sir Henry Baker):—

"There is a blessed home
Beyond this land of woe,
Where trials never come,
Nor tears of sorrow flow;

Where faith is lost in sight,
And patient hope is crown'd,
And everlasting light
Its glory throws around.

"There is a land of peace,
Good angels know it well;
Glad songs that never cease
Within its portals swell;
Around its glorious throne
Ten thousand saints adore
Christ, with the Father one,
And Spirit, evermore."

Many such specimens might be given if our object were to collect together the Christian Hymns relating to Heaven. Sometimes, too, we have beautiful descriptions not in verse, and Bunyan's account of the reception of Christian and Hopeful at the Celestial City will at once occur to the reader as not inferior in the claims of true poetry to anything that we have given.

247. Now, if we analyse these hymns of joy, there are in them two prominent chords, one or other of which is always struck. The first expresses the Christian's sense of relief from sorrow and death, and the second his joy in the anticipated presence of Christ—his intense desire to behold the King in his beauty.

Both of these are struck together by St. John, when he says (Rev. xxi. 3, 4), "And I heard a great voice out of heaven, saying, Behold, the tabernacle of God is with men, and he will dwell with them, and they shall be his people, and God himself shall be with them, and be their God. And God shall wipe away all tears from their eyes; and there shall be no more death, neither sorrow, nor crying, neither shall there be any more pain: for the former things

are passed away." In other respects the descriptions of the Christian heaven are no doubt figurative. They are intended for Christians of all ages of the world, and have hardly any reference to the material conditions of life in a future state. These could not be apprehended by believers 1800 years ago, inasmuch as we can hardly be said to grasp them now. Nevertheless there is one direction in which *we do think* we are able to obtain a glimpse into the conditions of this future life.

248. One of the most prominent characteristics of the human mind is its insatiable curiosity. How intensely anxious we all are to realise the conditions of the life of our forefathers in the ruder and earlier times; how interested in every scrap of intelligence which reaches us from the old dead world. How interested too in any light thrown upon the civilisation which preceded these old times. What would not any man give for half an hour with Socrates or Plato; what would he not give, be he Christian or unbeliever, to have pictured out vividly and truly before him some episode in the life of Christ? In a tedious, toilsome, roundabout way we do indeed get some passing glimpses into these ancient historical ages.

The earth is not unlike the human brain, in that it contains in itself certain memories of the past, and just as we rummage out and hunt up in our brains old memories, so do the historian and the antiquary search about in the earth for that memory which it retains of those distant but glorious ages. But the universe, no less than the individual, has another memory besides the material one, and we have endeavoured (Art. 196) to convince our readers that nothing is really lost, the past being always present in the universe. If this be the case, it may readily be conceived that this

universal memory may by some process of exaltation and intensification, or as it were by some relay battery of the universe, be occasionally quickened into such a life that the individual in the future and glorified state may be enabled (through the power of the Lord) to realise scenes that happened in the far distant past. For if so much can be accomplished with a thing so little plastic as the material memory of the earth, what may be done with that infinitely more plastic form of existence which we term the world to come?

249. Again, if in this present world we have great difficulty in realising our own past, we have even greater difficulty in realising what is at this very moment taking place in remote parts of the present visible universe. Astronomers and Physicists agree that life is possible in the planet Mars, and it is quite likely that intelligent beings analogous to ourselves exist at the present moment on the surface of that planet, but we shall never in this life know for certain anything about them. There is an insurmountable barrier to physical inquiry as great as if Mars belonged to the unseen universe, instead of being, what he is in reality, our next-door neighbour in the present.

Now, may not this barrier be removed in the future state? This has been a favourite topic with scientific theologians, and we believe that all who have speculated on the conditions of a future life have unanimously agreed that we shall have much greater freedom of motion in the world to come. In fine, our relations to time and space will then be greatly altered and enlarged. Men shall run to and fro in the universe, and knowledge shall be increased.

250. But yet the picture is not altogether one of intellec-

tual brightness and beauty. It wears also a moral aspect, and upon this almost exclusively the Christian records dwell. We are told in these records that nothing is forgotten. Christ tells us (St. Luke viii. 17), "Nothing is secret, that shall not be made manifest; neither anything hid, that shall not be known and come abroad." And again St. John tells us (Rev. xx. 12), "I saw the dead, small and great, stand before God: and the books were opened; and another book was opened, which is the book of life: and the dead were judged out of those things which were written in the books, according to their works." This thought has been developed by the Rev. Alexander Macleod, D.D., in a work entitled *The Books of Judgment.* This author points out that in many cases it may not be even necessary to appeal to the universe for the record that is therein written, for this is sufficiently stamped upon the body itself, and he then draws a vivid and lurid picture of the sensual man in whom the mortal body is like a parchment written within and without—a truly mournful and terrible record of the deeds done in the body.

But if all this is possible with an organism possessing so little plasticity as the natural body, and where the wish of the individual is to preserve a respectable exterior, what must be the case in the spiritual body[1] of such a man?—"If they do these things in a green tree what shall be done in the dry?" What a hideous and horrible likeness must not that foul thing have that issues forth from the "grave

[1] [Those who believe that the New Testament asserts the annihilation of the wicked in *Gehenna*, of course hold that only the just obtain the spiritual body. But we have no definite term for the body as it shall be (in the *Hades* of the New Testament) between death and the resurrection. It is probable that the want of such a term is due to the fact that the authors of our recognised version have unfortunately rendered both Hades and Gehenna indifferently by the word Hell, itself a term from Scandinavian mythology.]

and gate of Death" into the presence of the Unseen and Eternal?

251. It is extremely striking to read in this connection the following extract from Plato's *Gorgias*. We quote from Jowett's translation. Socrates is the speaker :—

"This is a tale, Callicles, which I have heard and believe, and from which I draw the following inferences : Death, if I am right, is in the first place the separation from one another of two things, soul and body;—this, and nothing else. And after they are separated they retain their several characteristics, which are much the same as in life; the body has the same nature and ways and affections, all clearly discernible; for example, he who by nature or training, or both, was a tall man while he was alive, will remain as he was after he is dead; and the fat man will remain fat; and so on : and the dead man, who in life had a fancy to have flowing hair, will have flowing hair. And if he was marked with the whip and had the prints of the scourge, or of wounds in him while he was alive, you might see the same in the dead body; and if his limbs were broken or misshapen while he was alive, the same appearance would be visible in the dead. And, in a word, whatever was the habit of the body during life would be distinguishable after death, either perfectly or in a great measure and for a time. And I should infer that this is equally true of the soul, Callicles; when the man is stripped of the body all the natural or acquired affections of the soul are laid open to view. And when they come to the judge, as those from Asia came to Rhadamanthus, he places them near him and inspects them quite impartially, not knowing whose the soul is: perhaps he may lay hands on the soul of the great king, or of some other king or potentate, who has no soundness in him, but his soul is marked with the whip, and is full of the prints and scars of perjuries, and of wrongs which have been plastered into him by each action, and he is all crooked with falsehood and imposture, because he has lived without truth. Him Rhadamanthus beholds, full of all deformity and disproportion, which is caused by licence and luxury and insolence and incontinence, and despatches him ignominiously to his prison, and there he undergoes the punishment which he deserves."

252. As, in Eastern monarchies, a veil was sometimes cast

over the face of the guilty ;[1] so in the New Testament the veil of darkness is drawn over the fate of the lost soul who falls into the hands of the living God. "And when the king came in to see the guests, he saw there a man which had not on a wedding-garment : and he saith unto him, Friend, how camest thou in hither, not having a wedding-garment ? And he was speechless. Then said the king to the servants, Bind him hand and foot, and take him away, and cast him into outer darkness ; there shall be weeping and gnashing of teeth."[2]

253. But this graphic and powerful picture of the fate of the lost given us in the New Testament fared as badly as other conceptions when it fell into the hands of the materialists of the middle ages. Its true meaning was entirely obliterated, and the Christian Hell, instead of being the Gehenna of the Universe, the place where all its garbage and filth is consumed, was changed into a region shut in by adamantine walls and full of impossible physical fires —the Devil being the chief stoker.

The one idea is awful, while the other is simply grotesque. An ancient Jew who had occasion to pass by the valley of Hinnom, and whose senses were invaded by the sights and smells of that doleful region, must have entertained a conception of the Hell described by Christ as different as possible from that which has reached us from the middle ages,

[1] "As the word went out of the king's mouth, they covered Haman's face."—Esther vii. 8.

[2] St. Matthew, xxii. 11-13. [See, however, also Luke xiii. 28, where the true meaning obviously is "*while ye are being cast out.*" There are other obvious mistranslations in our version ; such as for instance that of Mark ix. 43, where for "the fire that cannot be put out" we have "the fire that never shall be quenched." It is to be hoped that the revised version will be such as to give readers ignorant of Greek a thoroughly correct idea of the meaning of the original, most especially on points of such awful importance as this.]

and to which some even of the readers of this book may have been accustomed in their earlier years.

To some extent no doubt Christ's description of the Universal Gehenna must be regarded as figurative, but yet we do not think that the sayings of Christ with regard to the unseen world ought to be looked upon as nothing more than pure figures of speech. We feel assured that the principle of Continuity cries out against such an interpretation —may they not rather be descriptions of what takes place in the unseen universe brought home to our minds by means of perfectly true comparisons with the processes and things of this present universe which they most resemble?

254. Thus the Christian Gehenna bears to the Unseen Universe precisely the same relation as the Gehenna of the Jews did to the city of Jerusalem; and just as the fire was always kept up and the worm ever active in the one, so are we forced to contemplate an enduring process in the other.

For we cannot easily agree with those who would limit the existence of evil to the present world. We know now that the matter of the whole of the visible universe is of a piece with that which we recognise here, and the beings of other worlds must be subject to accidental occurrences from their relation with the outer universe in the same way as we are. But if there be accident, must there not be pain and death? Now these are naturally associated in our minds with the presence of moral evil.

We are thus drawn, if not absolutely forced, to surmise that the dark thread known as evil is one which is very deeply woven into that garment of God which is called the Universe.

In fine, just as the arguments of this chapter lead us to

regard the whole Universe[1] as eternal, so in like manner are we led to regard evil as eternal, and therefore we cannot easily imagine the Universe without its Gehenna, where the worm dieth not, and the fire is not quenched. The *process* at all events would seem to be most probably an enduring one. [Many passages of the New Testament, however, seem to point to a continuity of moral development in the unseen universe, a development whose climax is to be reached when the last enemy, death, is destroyed in Gehenna.]

255. But it is fruitless to expect that Science should throw any light upon that greatest of all mysteries—the origin of evil. We have now come to a region where we must suffer ourselves to be led solely by the light which is given us in the Christian Records. And while on this subject we would quote from a very remarkable work on the Lord's Prayer[2] by the Rev. Charles Parsons Reichel, B.D., which exhibits in a singularly clear light the testimony given by Scripture, as well as the fruitlessness of all attempts to obtain information from any other quarter. Our first extract relates to the personality of "The Evil One":—

"In refutation" (says the writer) "of the objections that have been urged against the personal existence of the Adversary, this one observation is quite enough: that of the world of spirits we cannot possibly know anything save by direct revelation. It is beyond the domain of the senses; it is beyond the cognisance of reason. A man born blind might therefore as rationally attempt to disprove by a process of reasoning the existence of a sense of which he can know nothing except by testimony, as we attempt by a process of reasoning to disprove the existence of a spirit of

[1] Including in it *a state of things* like the present physical universe; not, however, *the very things* that now exist, these being evanescent in energy at least, if not also in material.

[2] *Cambridge*, Macmillan, 1855.

whose existence we can know nothing save by testimony. The only point to be ascertained in either case is whether the testimony be sufficient. If the testimony of Scripture be deemed sufficient, then I cannot see that it is possible to deny the Personal existence of Satan any more than that of God. *How* Satan exists, or *where* at the present time, or how his power *avails*, as we are told it does, to contrive and suggest temptations to the mind of man; and to what extent he is aware of what is passing in men's minds, so as to adapt his suggestions to their weakness, we are not told, and do not therefore know. But our not being told the manner in which his power is exercised and brought to bear, is no proof of the unreality of that fearful Being who is everywhere in the New Testament exhibited as the adversary of God and goodness, whether in the individual, or in the development of the human race."

The next passage is one which all of us may study with much advantage. It refers to temptation :—

"Every risk incurred unnecessarily for the sake of exhibiting our trust in God, every unusual or unnecessary act done merely or chiefly for the purpose of displaying our privileges or our conviction, or of attracting attention and admiration, every stepping out of the plain, unadorned, and *unadmired* path of simple duty is a phase of it."

. . . . . .

"Why God should permit any of his creatures to be tempted is a question we can no more answer than we can that question of which indeed it is but a case, why God should permit evil to exist at all. But we know that evil does exist; and we know too that temptation does exist. That evil was first introduced into the world by a Being who goes under the name of Satan or the Adversary (2 Cor. xi. 3) we are told: that this Being endeavoured first to seduce, and afterwards to menace our Saviour into evil; and that he is constantly engaged in tempting us as he tempted Christ, we are also told."

. . . . . .

"And the true rendering of the last clause in Christ's own prayer would seem to intimate that the same Being is also busy in suggesting temptations to every follower of Christ—'Lead us not into temptation, but deliver us from the Evil One.'"

256. But we must now draw to a close; first of all, however, let us briefly sum up the results of our discussion.

The great scientific principle which we have made use of has been the Law of Continuity. This simply means that the whole universe is of a piece; that it is something which an intelligent being is capable of understanding, not completely nor all at once, but better and better the more he studies it.

In fine, in this great whole which we call the Universe there is no impenetrable barrier to the intellectual development of the individual. Death is not such a barrier, whether we contemplate it in others, or whether we experience it ourselves. And the same continuity which has been insisted on with reference to our intellectual conceptions of the universe applies, we have little doubt, to the other faculties of man, and to other regions of thought.

If then we regard the universe from this point of view we are led to a scientific conception of it which is, we have seen, strikingly analogous to that system with which we are presented in the Christian religion. For not only are the nebulous beginning and fiery termination of the present visible universe indicated in the Christian records, but a constitution and power are assigned to the Unseen Universe strikingly analogous to those at which we may arrive by a legitimate scientific process.

257. Our readers are now in a position to perceive the result of questioning science in this manner, and of abandoning ourselves without mistrust or hesitation to the guidance of legitimate principles. It is that science so developed, instead of appearing antagonistic to the claims of Christianity, is in reality its most efficient supporter; and the burden of showing how the early Christians got

hold of a constitution of the unseen universe, similar to that which science proclaims, is transferred to the shoulders of the opponents of Christianity.

258. For the present we would only add that the principle of the aid of which we have availed ourselves is not a mere theological weapon, but will, we believe, ultimately prove a most powerful scientific auxiliary. Already we have used it in our endeavour to modify the most probable hypothesis that has been formed concerning the ultimate constitution of matter.

The truth is, that science and religion neither are nor can be two fields of knowledge with no possible communication between them. Such an hypothesis is simply absurd.

There is undoubtedly an avenue leading from the one to the other, but this avenue is through the unseen universe, and unfortunately it has been walled up and ticketed with "*No road this way,*" professedly alike in the name of science at the one end, and in the name of religion at the other.

We are in hopes that when this region of thought comes to be further examined it may lead to some common ground on which followers of science on the one hand, and of revealed religion on the other, may meet together and recognise each other's claims without any sacrifice of the spirit of independence, or any diminution of self-respect. Entertaining these views we shall welcome with sincere pleasure any remarks or criticism on these speculations of ours, whether by the leaders of scientific thought or by those of religious inquiry.

It must never be forgotten that, whether we take the scientific or the religious point of view, one great object of our life in the visible universe is obviously to *learn;* and

that (as human beings are constituted) advance in learning necessarily implies a high purpose kept steadily before us, and a continuous and arduous pursuit. For, as we are told in the First Epistle of John, "This is the victory which overcometh the world, even our faith."

Τῷ νικῶντι δώσω αὐτῷ φαγεῖν ἐκ τοῦ
ξύλου τῆς ζωῆς . . .

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